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Announcement of Opportunity

Discovery Missions

Notice of Intent due: September 2, 1994

Proposals due: October 21, 1994

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AO No. 94-OSS-03

August 4, 1994

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

OFFICE OF SPACE SCIENCE

Washington, DC 20546-0001

ANNOUNCEMENT OF OPPORTUNITY

DISCOVERY MISSIONS

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DISCOVERY MISSIONS

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1.0 DESCRIPTION OF OPPORTUNITY

1.1 Introduction

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct planetary science investigations in the Discovery Program. The Discovery Program is intended to accomplish high quality, focused planetary science, utilizing innovative, streamlined, and efficient management approaches. It seeks to substantially reduce total mission cost and improve performance through the use of new technology and through commitment to, and control of, design/development and operations costs. Finally, it seeks to enhance public awareness of, and appreciation for, space exploration and provide educational program activities.

The Discovery Program will carry out planetary flight missions with highly controlled and low total cost. Proposals to the Discovery Program will require a careful trade-off between science and cost in order to produce missions with the highest possible science value per unit cost. Total cost to NASA for all mission phases including launch services will be a determining factor in selection. Total cost includes preliminary analysis (Phase A), definition (Phase B), design and development (Phase C/D), launch services, and mission operations and data analysis (Phase E). Failure to meet negotiated cost ceilings and schedule milestones at any stage in the Discovery Program is cause for termination of the mission.

In order to limit total cost in the Discovery Program, there will be absolute constraints on the cost of the design and development phase (Phase C/D) and on the mission operations and data analysis phase (Phase E). In Fiscal Year (FY) 1992 dollars, Phase C/D is limited to \$150M or less, and Phase E is limited to \$35M.

Launch vehicles and services require use of a NASA-provided medium (Delta II) class or smaller launch service unless the launch service is included as part of a team's proposed Phase C/D cost or is contributed by a team member. Contributions of any sort to Discovery missions by organizations other than NASA are welcome, but the level of such contributions will be restricted. All Discovery proposals must include the total cost of all contributions required to complete the mission from Phase A through mission completion.

In order to meet the Discovery Program goal of a high flight rate for planetary missions, there are constraints limiting mission definition and development times. Phase A/B is limited to 18 months or less, and Phase C/D is limited to 36 months or less from start through launch plus thirty days. The length of mission operations is controlled by cost constraint. Phase E costs greater than \$35M will be permitted if Phase C/D costs are reduced accordingly. Discovery missions in Phase E should distribute expenditures so as to minimize the cost of mission operations and maximize the investment in data analysis.

NASA is interested in promoting a diversity of science missions by means of a high flight rate in the Discovery program, thereby providing maximum opportunity for the planetary science community. Missions proposed at or near the cost cap will be selected if the science is compelling. However, a balance will be sought between

lower and higher cost missions that will allow a launch every 12 to 18 months within the Discovery funding profile.

This announcement solicits proposals for the third, and possibly fourth, Discovery missions. These proposals must be for complete missions from project initiation (either Phase A, Phase B, or Phase C/D) through operations (Phase E) and which are otherwise consistent with the criteria described herein. NASA will select several proposals which will be subject to a competitive down selection at the end of each phase. In addition, NASA may select a small mission (one with total mission costs less than \$150 million) to proceed directly to launch (down selection is waived), if such a mission is proposed which is sufficiently well defined to allow a launch near the end of 1998.

1.2 Proposal Opportunity Period and Schedule

The nominal schedule for investigations selected via this and subsequent Discovery Mission AO's will be less than five years from selection to launch. This includes nine months, each, for Preliminary Analysis and Technical Definition studies, the time needed to review the investigation's progress and determine whether it should proceed to the following phase, plus a maximum of three years for the Design/Development phase (which includes launch and a preliminary spacecraft operations period of 30 days). Proposers are encouraged to propose missions with schedules shorter than the nominal schedule described above.

NASA recognizes that some investigations offered in response to this AO may be sufficiently mature to proceed immediately to the Definition Study phase (Phase B), or to the Design/Development phase (Phase C/D). Investigators are not precluded from proposing investigations that begin with Phase B or Phase C/D. However, investigators are advised that NASA does not anticipate funding sufficient to commence Phase C/D of a Discovery mission will be available until FY 1996.

The opportunity described here is for a single proposal selection cycle, according to the nominal schedule shown below. Proposals are due October 21, 1994, and selections will be made in January 1995. Several investigations will be selected as a result of this announcement, leading to a third and possibly fourth Discovery mission.

The nominal schedule is as follows:

Date of AO release	August 4, 1994
Preproposal briefing.....	TBD
Notices of intent due.....	September 2, 1994
Proposals due	October 21, 1994
Latest date to accept non-U.S. Government endorsement.....	November 21, 1994
Announcement of selections (target)	January 1995
Initiation of Preliminary Analysis studies (target).....	Early 1995
Initiation of Definition Study (target).....	November 1, 1995
Initiation of Design/Development (target).....	October 1, 1996
<u>Latest launch date (nominal)*</u>	<u>August 31, 1999*</u>

* In some cases, later launch dates will be permitted. See below.

Celestial mechanics may dictate launch windows for some investigations that are inconsistent with the schedule described above, so some flexibility in the timing and duration of the proposed phases of an investigation is permitted, if it is determined to be within the scope of the NASA's programmatic and budgetary constraints. Such flexibility could entail the elimination of one or both of the study phases (Preliminary Analysis and Definition) or could include delaying the start of the Design/Development phase (Phase C/D) up to a year or more. However, in no case should the proposed Phase C/D period (including launch-plus-30-days) exceed 36 months. Given this flexibility, the latest possible launch date that may be considered for missions proposed in response to this AO is August 31, 2001. Investigations with launch dates later than August 31, 2001, should be proposed to a subsequent Discovery Mission AO.

2.0 PROGRAM GOALS AND OBJECTIVES

2.1 Solar System Exploration Division Goals

The Discovery Program is managed by NASA's Solar System Exploration Division (SSED). The SSED seeks to expand human knowledge of the physical universe through the study of our solar system and planetary systems in general. The scientific goals of the SSED are as follows:

- To determine the present nature of the solar system, its planets, moons, and primitive bodies, and to search for other planetary systems in various stages of formation, in order to understand how the solar system and its objects formed, evolved, and (in at least one case) produced environments that could sustain life.
- To better understand the planet Earth by determining the general processes that govern all planetary development and by understanding why the "terrestrial" planets of the solar system are so different from each other.
- To establish the scientific and technical data base required for undertaking major human endeavors in space, including the survey of near-Earth resources and the characterization of planetary surfaces.

These goals encompass a wide range of scientific questions spanning a variety of scientific disciplines. The SSED seeks to address these questions by supporting investigations in three broad categories: (1) laboratory research and theoretical analyses; (2) ground-based astronomical observations; and (3) flight projects. The Discovery Program solicits only those investigations which fall into the third category. Missions proposed as flight projects in the Discovery Program may include Earth-orbiting spacecraft, flyby and/or rendezvous/orbiter spacecraft, soft landers and/or penetrators, and sample return missions, but are not necessarily restricted to these options.

2.2 Discovery Program Goals

As a part of the Solar System Exploration Division's program of planetary science, the Discovery Program will address the general scientific goals of the SSED. In addition, there are also several specific goals of the Discovery Program itself:

Goal 1: Perform high-quality scientific investigations that will maintain U.S. leadership in planetary science and that will assure continuity in the U.S. solar system exploration program.

By conducting a series of focused, cost-effective missions to answer critical questions in planetary science, the Discovery Program will help maintain the excellence of the United States' solar system exploration program. By launching Discovery missions on a frequent, regular basis, NASA will provide a mechanism by which the most pressing questions in planetary science may be addressed in a timely fashion, permitting a steady improvement in our understanding of the solar system and the processes that affect it.

Goal 2: Pursue innovative ways of doing business.

The short development schedule and low costs associated with Discovery demand innovative business and management practices. NASA's approach to Discovery missions encourages teaming arrangements among industry, university, and Government partners. Competitively selected teams will have responsibility and authority to accomplish the mission. This will permit them to utilize innovative approaches necessary to stay within the strict cost and schedule limits of the Program. The NASA program management structure will be streamlined, with NASA oversight and reporting requirements limited to that which is essential to assure mission success and agreed upon science return in compliance with committed cost, schedule, performance, reliability, and safety requirements.

Goal 3: Encourage the use and transfer of new technologies in achieving program objectives.

The proposed inclusion of new technology to achieve performance enhancements and total mission cost reductions, as well as the potential for transfer of those technologies to a broader community, will be considered in the selection of new missions. The Discovery Program will identify and support development and application of candidate new technologies for its missions and will encourage the transfer of those technologies to the broader scientific community and other markets. The teaming of industry, university, and Government is meant to foster an environment conducive to technology transfer occurring in parallel with technology development.

Goal 4: Enhance general public awareness of, and appreciation for, solar system exploration and support the Nation's educational initiatives.

Inclusion of the public and the education communities are goals of the Discovery Program and of the Office of Space Science as a whole. The Discovery Program is committed to identifying appropriate techniques to capture and hold public interest and

to provide educational program activities that support the Nation's educational initiatives.

2.3 Announcement Objectives

This AO invites proposals for the third Discovery mission. If programmatic constraints permit, NASA may also choose to select the fourth Discovery mission from investigations proposed in response to this AO.

Proposals are invited for complete investigations of significant solar system science questions which meet the goals of SSED and the Discovery Program defined above. The SSED develops and evaluates the program strategy to address these goals in consultation with the scientific community directly and via advisory groups such as NASA's Solar System Exploration Subcommittee (SSES) and the National Academy of Sciences' Committee on Planetary and Lunar Exploration (COMPLEX).

Only proposals to execute complete flight projects through the delivery of the data to the Planetary Data System (PDS) will be accepted; proposals describing portions of missions (such as the provision of an instrument as part of a non-U.S. mission) or which do not address all phases from Preliminary Analysis through Operations and delivery of the data will be returned to the proposer. NASA will solicit investigations for portions of missions through future announcements.

Should an investigation selected for Phase A or B study in FY 1995 not be chosen to enter Phase B or Phase C/D in FY 1996 or FY 1997, the investigation team may elect to recompile for a future flight opportunity through a subsequent Discovery Mission AO. It is expected that subsequent AO's will be released every 12 to 18 months, with the intention of supporting the launch of one Discovery mission for every AO.

3.0 DISCOVERY PROGRAM CONSTRAINTS, GUIDELINES, AND REQUIREMENTS

3.1 General Program Constraints and Guidelines

In the Discovery Program, the major responsibility for the investigation is in the hands of the investigation team. The team will have a large degree of freedom in accomplishing its objectives within the stated constraints and with only essential NASA oversight. Once a mission has been selected, failure to maintain reasonable progress on an agreed upon schedule or failure to operate within the constraints outlined below will be cause for termination of the investigation by NASA. Consequently, missions should be designed and scoped to emphasize mission success within cost and schedule constraints by incorporating sufficient margins, reserves, and content resiliency.

Only those missions whose proposed cost, design/development schedule, and launch vehicle requirements are within the constraints and guidelines identified herein will be considered as candidates for selection. Missions significantly below the cost and launch vehicle constraints, are encouraged in order to enable more frequent Discovery Program launches and a diversity of missions.

This section describes the constraints and guidelines of the Discovery Program and its missions. The major program constraints and guidelines are summarized in Appendix B. Specific directions and requirements for proposal preparation are included in Section 4 and in Appendix D.

3.1.1 General Program Constraints

The Discovery Program is part of an effort to develop a program of frequent, successful small planetary missions. To this end, the SSED will limit its funding of Discovery mission design/development costs (costs incurred from the start of Phase C/D to launch plus 30 days) and mission operations and data analysis (Phase E) to \$150 million or less and \$35M or less, respectively, in FY 1992 dollars. Phase E periods which require funding levels greater than \$35M are permitted if Phase C/D costs are reduced accordingly. Phase A and B costs will also be funded by the SSED but will not be considered within the \$150 million design/development cap.

The Discovery Program is also intended to provide a mechanism to accomplish important scientific investigations within a short time, so the schedule for all Discovery missions must be such that launch takes place within 35 months of the start of the design/development phase (Phase C/D). Note that the design/development phase is defined as ending 30 days after launch, so the maximum permissible length of any Discovery mission Phase C/D is 36 months. No constraint is placed on the length of Phase E.

The most cost-effective, flight-proven expendable launch vehicle (ELV) is to be used. If the ELV is to be provided by NASA, then it must be a Delta-II or smaller and it must be manufactured by and purchased from a domestic organization. In this case, the launch vehicle costs will be funded by NASA and will not be considered within the \$150 million design/development cap, but will be factored into the total mission cost.

NASA will allow teams to acquire ELV launch services directly if they include them as part of the proposed Phase C/D cost and if the ELV is manufactured by and purchased from a domestic organization. In this case, the launch vehicle costs will be considered within the \$150 million design/development cap.

The use of Radioisotope Thermal Generators (RTG's) is not permitted on Discovery Missions proposed to this AO. Other, smaller radioactive sources (such as radioactive heating units or instrument calibration sources) are permitted.

Finally, for this Discovery Missions AO, proposed missions must have launch dates on or prior to August 31, 2001.

3.1.2 General Program Guidelines

Discovery Mission teams may be led by Principal Investigators (PI's) at all categories of domestic and nondomestic organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies.

Teaming arrangements among universities, industry, and Government agencies are encouraged. Teams are encouraged to utilize industry participation to the fullest extent reasonable. NASA field centers, including the Jet Propulsion Laboratory, are welcome as Discovery mission team members. When a NASA field center participates as a member of a Discovery mission team, it should do so because it brings unique skills, facilities, and/or capabilities to the team.

Contributions of any kind (i.e., labor, material, services, travel funds, etc.) to Discovery missions by organizations other than the SSED are welcome, but to assure that the missions remain small, the sum of additional contributions to a given mission should not exceed approximately one-third (1/3) of the proposed cost to the SSED for the design/development phase of that mission or \$50 million (FY 1992), whichever is less. Such contributions may be applied to any part, or parts, of a mission, and will not be charged against the NASA design/development cost-cap of \$150 million (FY 1992), but must be included in the calculation and discussion of the total mission costs.

The cost of contributed hardware should be estimated as either: (1) the cost associated with the development and production of the item if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (2) the cost associated with the reproduction and modification of the item (i.e., any recurring and mission-unique costs) if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone). The cost of contributed labor and services should be consistent with rates paid for similar work in the offeror's organization. The value of materials and supplies shall equal the fair market value of the property at the time of contribution.

The provision of a launch vehicle and launch services as a contribution to a Discovery mission by a domestic or nondomestic partner is acceptable only if it is on a no-exchange-of-funds basis (i.e., at no cost to NASA). In this case, the launch vehicle and launch services will not be charged against the ~1/3 limit on additional contributions, but their costs will be included in any calculation and discussion of total mission costs.

3.1.3 Total Mission Cost Guidelines

All proposed Discovery missions will be expected to calculate and maintain an estimate of the Total Mission Cost (TMC), where the TMC is defined as those costs necessary to accomplish all phases of the mission from Phase A through Phase E, regardless of the source of funding (i.e., whether provided by the SSED or contributed by another organization). The first such estimate will be required as part of the mission proposal and subsequent estimates will be required in regular reviews. The TMC includes, but is not necessarily limited to, the costs for preliminary analysis and definition, design and development, launch vehicle(s) and launch services, mission operations, data analysis, science teams, mission-unique ground systems equipment, and all personnel required to conduct the investigation and deliver the data in archival format to the PDS. Total mission cost will be one factor in the selection of missions and in the ongoing evaluation of missions. Should the TMC or the Phase C/D

component increase from the baseline estimate by greater than 15% at any stage in the process, the investigation is subject to cancellation by NASA.

3.2 International Participation

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international participation, participation by non-U.S. individuals and organizations as team members in Discovery Program investigations is permitted.

Participation by international partners in Discovery missions that involves the contribution of scientific instruments, the spacecraft, or a portion thereof, and the subsequent sharing of the data from the mission, on a no-exchange-of-funds basis is welcomed. Launch vehicles and launch services may also be contributed by international partners but, unlike other contributions, are not subject to the "one-third" limit. However, they should be included in all calculations and discussions of the total mission costs.

The direct purchase of goods and/or services from nondomestic sources is permitted, but with the following restriction: NASA will not purchase non-U.S. launch vehicles for Discovery missions, nor may funds provided to a Discovery mission team be used to purchase a launch vehicle from a non-U.S. source.

Potential Discovery participants are advised that international purchases made using funds derived from NASA must meet NASA and Federal regulations and that these regulations will place an additional burden on investigative teams that should be explicitly included in discussions of the investigation's cost, schedule, and risk management. Information regarding regulations governing the procurement of foreign goods or services is provided in Appendix G.

Since Discovery investigations must be for entire missions and will be evaluated on their design/development cost, total mission cost, and management aspects, as well as their scientific, technical, and programmatic merit, any proposed international participation must be described at the same level of detail as that of domestic partners. This includes the provision of full cost, schedule, and management data in the proposal and in subsequent reviews. In the AO process, failure to document all cost and schedule data, management approaches and techniques, or failure to document the commitment of all team partners to those costs and schedules may cause a proposal to be found unacceptable.

Participation by nondomestic individuals and/or institutions as team members or contributors to Discovery investigations must be endorsed by the institutions and governments involved. Letters of endorsement must be signed by institutional and governmental officials authorized to commit their organizations to participation in the proposed investigation, and must be submitted with the proposal. (See Section 4.4)

3.3 Science Requirements

Discovery missions are intended to perform focused planetary science investigations. The relationship between the scientific objectives, the data to be returned, and the instrument payload to be used in obtaining the desired data must be unambiguous. Discovery investigation teams will be responsible for initial analysis of the data, its subsequent delivery to the PDS, and the publication of preliminary scientific findings. Information on the PDS, its formats, and its requirements is included in the Discovery Program Library (DPL) discussed in Section 4.1.1.

Every Discovery Mission should have both a "Baseline" mission and a "Performance Floor." The "Baseline" mission refers to that mission which, if fully implemented, will accomplish the entire set of scientific objectives identified for the mission at the initiation of Phase A. Any alteration of the mission which results in a reduction of the mission's ability to accomplish the "Baseline" set of scientific objectives as identified at the beginning of Phase A will be considered a "descope" of the mission. The resulting set of achievable scientific objectives must be reviewed to ensure that the mission remains at or above the "Performance Floor."

The "Performance Floor" is the minimum science component below which the mission will not be considered justifiable for the proposed cost. The "Performance Floor" must be identified and documented for each proposed Discovery Mission along with plans for the prioritized descope of mission capability from the "Baseline" to the "Performance Floor" in the event of cost or schedule growth. Failure to maintain a level of science return at or above the performance floor as determined by NASA will be cause for termination of the investigation at any time.

Any issues with the design and/or performance characteristics of the instruments that impact the ability of the mission to meet the stated objectives should be described, along with alternatives to mitigate that impact.

Any samples of extraterrestrial planetary materials returned by Discovery missions shall be delivered to the laboratory facilities operated by the Office of the Curator at NASA's Johnson Space Center (JSC). Investigation teams will be responsible for all aspects of the delivery of such materials to the Office of the Curator. The Office of the Curator will be given the task of providing for the physical security, inventory accountability, environmental preservation, and distribution of the samples in support of scientific research programs organized around each mission.

For every Discovery mission in which extraterrestrial planetary materials are returned to Earth, the JSC Office of the Curator will perform sample processing in support of the mission science team. The science team shall be allocated only a fraction of the returned sample, e.g., no more than 25 percent by mass. The remainder shall be kept in pristine condition for research by the community at large.

If a Discovery mission involves the operation of a flight system as a facility instrument or observatory during the operations phase, then NASA, in cooperation with the PI, may solicit proposals for Guest Investigators (GI's). NASA reserves the right to add

GI's toward the end of the design/development phase or during operations. In the event NASA were to choose to add such GI's, then NASA would assume full management and financial responsibility for these additional investigations.

There shall be no proprietary data rights period for Discovery missions. Discovery mission teams will be responsible for collecting the scientific, engineering, and ancillary information necessary to validate and calibrate the scientific data prior to depositing it in the PDS. The time required to complete this process should be the minimum necessary to provide appropriate data to the scientific community and the general public. The Discovery Missions selection process will reward those proposals with the shortest times for access to the data following its receipt by the investigation team. Investigation teams are expected to include an appropriate data analysis period independent of the PDS archiving activities as a part of their funded Phase E activities.

3.4 Technical Approach Requirements

Discovery missions must include all technical aspects of the investigation from the Preliminary Analysis (Phase A) through delivery of the data to the PDS and its analysis (the final part of the Operations phase, Phase E). NASA Handbook (NHB) 7120.5 ("Management of Major System Programs and Requirements") delineates activities, milestones, and products typically associated with each of these phases and should be used as a reference in defining a team's mission approach. Mission teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated.

3.5 Opportunity Requirements

The Discovery Program represents an opportunity for NASA to develop and test new technologies and applications, as well as transfer those technologies and applications to the private sector. It will also provide an opportunity for educational program activities that support the Nation's educational initiatives. Finally, the Discovery Program also represents an opportunity for NASA to enhance and broaden public awareness of, appreciation for, access to, and participation in, solar system exploration.

NASA is attempting to more successfully infuse new technologies into its programs and strengthen the mechanisms by which it transfers its technologies to the private sector, including the non aerospace sector. The means by which NASA's Office of Space Science (OSS) plans to implement these processes is described in the OSS Integrated Technology Strategy, which is included in the DPL described in Section 4.1.1.

For Discovery missions, "new" technologies may be infused through a number of mechanisms, including:

- the use of a novel invention which has only been tested in a ground laboratory or testbed;

- the use of a product or approach in existence for some time for ground applications or for commercial purposes, but never before used as a part of a flight mission; or
- the use of a product or approach already in use in classified applications, but never before flown in a civilian space science mission.

However, the infusion of new technologies alone is not sufficient. Discovery missions are also expected to help NASA achieve the goal of "Technology Transfer." Technology transfer is defined here as the transition of scientific and engineering knowledge from one entity to another for a potentially useful purpose. For the OSS (and, thus, the Discovery Program) the emphasis is placed on technology transfer from NASA to the private sector, including the nonaerospace industry, for use in or as a commercial product or process. In this case, transfer of technology is deemed to have occurred when both the following have occurred:

- (1) NASA participated in the development by having:
 - contributed funds to the laboratory development;
 - provided resources (financial or in-kind) for flight tests; or
 - validated it on one of its science missions or science experiments;
- (2) The technology has been or is in the process of being incorporated into a commercial product, service, or process. Effectiveness measures for assessing the success and impact of the transfer will include:
 - Potential U.S. economic impact, including the probability of subsequent commercialization; potential increases in jobs and sales; cost and time savings; and the importance of the existing or potential industry sector affected;
 - Number of acknowledged uses (could include written statements from the proposer's industrial partners that they are using a NASA technology in their commercial products, processes, or services);
 - Types of products and services being produced;
 - When products and services will enter the marketplace; and
 - Evidence of a strong commitment by proposer to complete and, if appropriate, provide support for commercialization of the technology beyond the period of NASA funding.

Further information may be obtained in the OSS Integrated Technology Strategy, which is included in the DPL.

NASA's Office of Advanced Concepts and Technology (OACT) sponsors and operates technology transfer programs to facilitate the transfer and commercial use of space technology. Through a collaborative agreement with the OSS, these tools and facilities will be available to Discovery mission teams and potential proposers in addressing this aspect of the work.

Discovery investigations should include activities which will enhance the level of understanding and awareness of solar system exploration by the public. Public

information programs that will inform the public by mass media or other means, or other innovative ideas for bringing planetary science to the public are encouraged. Educational activities coordinated with educational institutions are also encouraged. Such activities might include substantial participation by teachers and students in the investigation and the development and utilization of programs that will involve educational institutions at any level in the investigation. Further information on educational plans for the Discovery Program is included in the Discovery Program Management Plan included in the DPL.

Discovery missions will be required to contain a plan to meet the subcontracting goals as set forth in Appendix C, paragraph XIII. Contracting and subcontracting with small businesses or other organizations owned and controlled by socially and economically disadvantaged individuals which include women, historically black colleges and universities, and other minority educational institutions is mandatory, as explained in Appendix C, paragraph XIII. Investment in these entities reflects NASA's commitment to increasing the participation of minority concerns in the aerospace community, and is to be viewed as an investment in our future. These entities, when involved, should have a substantial role in the program.

3.6 Cost Requirements

Discovery Program missions are to be cost constrained. Missions are constrained to design/development costs of \$150 million (FY 1992) or less and design/development periods (including 30 days after launch) of less than 3 years. Mission operations and data analysis (Phase E) costs are constrained to \$35M (FY92 dollars) or less but the length of Phase E is not constrained. Long Phase E periods which require funds greater than \$35M are permitted if Phase C/D costs are reduced accordingly.

A major goal of designing a Discovery Mission is to reach a balance between science return and total mission cost. Therefore, design trade-off studies must take into consideration total end-to-end costs. Proposed Discovery missions must maintain a separate estimate of the total mission cost. This includes all costs incurred in Phases A through E, including the Preliminary Analysis and Definition studies, Design/Development costs, launch vehicle and any upper stages, mission operations and data analysis costs after "Launch-plus-30 days," and other mission-unique costs. Mission-unique costs may include (but are not limited to) such items as insurance, DSN costs, labor (including contractor and civil servant) costs, and costs associated with transferring the new technology developed to other applications and users.

The Preliminary Analysis (Phase A) and Definition (Phase B) studies are intended to result in more accurate estimates of both cost and schedule. During Phases A and B, the Baseline mission and options for descoping the mission are investigated. The timing and rationale for implementing different options are evaluated and refined on the basis of their effect on cost, schedule, and mission performance. Experience has shown that a reasonably accurate estimate of design/development costs is obtained if a total amount equivalent to approximately 6-10 percent of a mission's design/development cost is spent on the Phase A and B studies.

Costs associated with any contributions from domestic or nondomestic sources must be documented and endorsed by all institutions directly involved with those costs. Contributed costs should be accounted for as described in Section 3.1.2.

Proposed Discovery missions must maintain a funding profile over time. This profile (and hence the total estimated cost) may need to be negotiated for a selected Discovery mission in order to integrate that mission within the constraints of the ongoing Discovery Program budget. At all times, the estimated cost baseline must identify credible, phased reserves, which are proportional to the development risk. The negotiated cost baseline shall be considered to be firm during the Definition phase (Phase B) and fixed and committed at the conclusion of this phase.

Potential investigation teams are encouraged to use current, available NASA navigation, tracking, control, communications, and other capabilities. However, the planned usage of other available or mission-unique operations control centers is not precluded and should be identified and costed as appropriate.

Every aspect of a Discovery Mission should reflect a commitment to mission success while keeping total mission costs as low as possible. Every component of a proposed Discovery mission, from the mission design to the selection of the launch vehicle to the approach to mission operations, will be evaluated on that basis in the selection process. Missions with very low total mission costs are encouraged as a means of maintaining a high flight rate in the Discovery Program, thereby providing maximum opportunity for the planetary science community.

3.7 Management Requirements

It is the intent of NASA to give the Principal Investigator (PI) and the team the ability to use their own processes, procedures, and methods to the fullest extent possible. The investigation team should develop a Work Breakdown Structure (WBS) that best fits their organizational approach and their mission design concept.

Discovery mission teams should define the management approach that is best suited for their particular teaming arrangement. Several options for discharging mission management responsibilities were defined at the April 1993 Discovery Management Workshop and are discussed in the two reports that resulted from that Workshop - "Final Report on the Discovery Management Workshop" and "Recommendations for Discovery Policy and Implementation Guidelines."

The PI is expected to be the central figure in each Discovery mission, with full responsibility for all aspects of the mission. The PI should be the lead scientist who assembles a team to propose and implement a Discovery mission. The PI must be accountable to NASA for the scientific success of the mission and must be prepared to recommend mission termination when, in the judgment of the PI, the successful achievement of established minimum science objectives is not likely within the committed cost and schedule reserves. In addition to being responsible for the overall success of the mission, the PI may have other mission responsibilities depending upon the management approach adopted by the team.

Each Discovery investigation should have a Project Manager (PM) who will oversee the technical implementation of the mission. The role and experience of the PM should be adequate to insure that the technical needs of the investigation will be met. Other key individuals, their roles, and the adequacy of their experience should be identified for each Discovery investigation.

Every Discovery investigation should also define the risk management approach it intends to use to insure successful achievement of the mission objectives within established resource and schedule constraints. In addition, any manufacturing, test, or other facilities needed to insure successful completion of the mission's objectives should be identified for every Discovery investigation.

4.0 PROPOSAL SUBMISSION INFORMATION

4.1 Preproposal Activities

4.1.1 Discovery Program Library

The Discovery Program Library (DPL) is intended to provide additional background technical information. Included will be information on the Discovery Program, launch vehicles, Deep Space Network capabilities, NASA's technology transfer infrastructure, the Office of Space Sciences' Integrated Technology Strategy, the Planetary Data System (PDS), and existing NASA test and mission operations facilities. The contents of the DPL are listed in Appendix H. This information will be available at the preproposal briefing.

4.1.2 Technical and Scientific Inquiries

Inquiries of a technical or programmatic nature should be directed to Mr. Mark Saunders and inquiries of a scientific nature should be directed to Mr. Henry Brinton at the address below:

Mr. Mark P. Saunders, Discovery Program Manager or
Mr. Henry C. Brinton, Discovery Program Scientist
Solar System Exploration Division
Code SL
Ref.: AO No. 94-OSS-03
National Aeronautics and Space Administration
Washington, DC 20546

Fax Number: 202-358-3097

e-mail: (Internet) msaunders@sl.ms.ossa.hq.nasa.gov
hbrinton@sl.ms.ossa.hq.nasa.gov

4.1.3 Preproposal Briefing and Technology Fair

A preproposal briefing will be held at a date and time to be announced separately. The purpose of this briefing will be to address questions about this AO. The preproposal briefing will address all those questions received by Mr. Saunders or Mr. Brinton via fax, mail, or electronic mail at the address given in Section 4.1.2 on or before August 18, 1994. Additional questions submitted after this date, including those provided in writing at the preproposal briefing, may be addressed at the briefing only as time permits. A "Discovery AO Preproposal Briefing Transcript," including answers to all questions submitted to the Discovery Program Office up to that time, and those not addressed at the briefing, will be prepared. This transcript will be mailed approximately two (2) weeks after the Preproposal Briefing to the following individuals: (1) Those who have already submitted a Notice of Intent (see Section 4.1.4); (2) those attending the preproposal briefing; and (3) anyone submitting a request for this document to Mr. Saunders by letter, fax, or electronic-mail.

A "Discovery Technology Fair" will be held following the Preproposal Briefing. The purpose of this Fair will be to assist potential Discovery mission teams in the areas of technology transfer and technology infusion. In this way the Fair is intended to provide help with the implementation of the OSS Integrated Technology Strategy.

4.1.4 Notice of Intent

To assist NASA's planning of the proposal evaluation process, a written and signed Notice of Intent must be submitted by all prospective proposers on or before September 2. This Notice must be typewritten in English and must be addressed to Mr. Henry C. Brinton, Discovery Program Scientist, at the address in paragraph 4.1.2.

Principal Investigators whose investigation teams include nondomestic institutions should send their Notice of Intent to the same address, but should also send a copy to:

Ms. Helen Lambert
International Relations Division
Code IRD
Ref.: AO No. 94-OSS-03
National Aeronautics and Space Administration
Washington, DC 20546
USA

Fax Number: 202-358-3029

In cases where investigators or team members from nondomestic institutions are to participate, their names, addresses, and affiliations must be included in the Notice of Intent, even if the details of their participation cannot be formalized by the deadline for receipt of the Notice of Intent.

The Notices of Intent should include the following information:

- (a) Names, addresses, telephone numbers, and fax numbers of the following: (1) Principal Investigator; (2) Co-Investigators; and (3) lead representative from each organization (industrial, academic, not-for-profit, and/or Federal) included in the team. If any team members are from nondomestic institutions, the mechanism by which these members will be funded should also be identified.
- (b) A brief statement of the scientific objectives of the investigation.
- (c) A brief overview of the management approach and mission design, including the identification of new technologies that may be employed as part of the mission.

Material in a Notice of Intent is for NASA planning purposes only and is not binding.

4.2 Format and Content of Proposals

4.2.1 General Proposal Format

A uniform proposal format will be required from all proposers in order to aid in proposal evaluation. General information and further proposal preparation information are provided as Appendices A, C, and D to this AO. The required proposal format and contents are summarized below. Failure to follow this outline may result in reduced ratings during the evaluation process and could lead to rejection of the proposal.

- The cover page of the proposal shall clearly indicate the Investigation being proposed and the name of the Principal Investigator. This cover page should be attached to the front of Volume I (see below).
- A signature page (or pages) must follow the cover page of the proposal at the front of Volume I. This signature page must state the title(s), name(s), address(es), affiliation(s), telephone number(s), and fax number(s) of the PI, Project Manager, Co-I's, the lead representatives from each organization represented on the team, and the authorizing official from each organization represented on the team. The signatures of these individuals must also be included on this page(s). A sample signature page showing an acceptable format is included in Appendix D.
- Certifications required by Federal law are included as Appendices I, J, and K in this AO and should be included as an appendix to Volume III (see below).
- All documents must be typewritten in English, use the International System of units (SI), and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, floppy disk, etc., is not acceptable. In evaluating proposals, NASA will only consider printed material. A modest amount of additional information, such as recent publications, may be added as appendices to the proposal. However, to ease the burden of proposal

preparation and review, no commitment is made by NASA to consider material in appendices of a proposal in its evaluation.

- The proposal must consist of three volumes: Volume I—"Executive Summary," Volume II—"Science and Technical Approach" (and appendices); and Volume III—"Cost and Management Plan."
- The content of Volume I is discussed in Section 4.2.2. Volume I is limited to a maximum of five single-spaced, typewritten pages, without reduction and exclusive of the cover page, fact sheet, and signature page(s). Volume I may not contain any foldout pages. In complying with page limits, no page should contain more than 50 lines of text and the type size should not be smaller than 12 point. One copy of Volume I should be attached to the front of each copy of Volume II and one attached to the front of each copy of Volume III. The cover page of the copy of Volume I which is attached to Volume II should indicate that it is attached to Volume II, and the cover page of the copy of Volume I which is attached to Volume III should indicate that it is attached to Volume III. Separate copies of Volume I should not be included.
- A separate, one-page "fact sheet" is required as part of Volume I but this page will not be counted against the five-page limit. This fact sheet is restricted to one (1) side of one page of paper, with no restrictions on print size. There are also no restrictions on the type of paper upon which the fact sheet is printed (i.e., glossy paper is permitted).
- Volumes II and III should be formatted to be consistent with the outlines presented in Appendix D and the requirements of Section 3.
- Volume II is limited to a maximum of 75 single-spaced, typewritten pages, without reduction, including illustrations and tables, and may contain no more than five foldout pages (28 x 43 cm) (i.e., 11 x 17 inches).
- Volume III is limited to a maximum of 75 single-spaced, typewritten pages, without reduction, including figures, tables, and charts.
- For both Volumes II and III, single- or double-column format is acceptable. The cover page, table of contents, reference list, and Volume I (attached at the front of each of these volumes) will not be counted against the 75-page limit of each volume. Resumes, other personnel information, or other supporting documentation may also be included as appendices, which are not counted against the 75-page limit. However, NASA makes no commitment to review material presented in excess of 75 pages. In complying with page limits, no page should contain more than 50 lines of text and the type size should not be smaller than 12-point.
- Cost estimates should be shown by mission phases and by U.S. Government fiscal year (October 1–September 30) in actual-year dollars, except where noted in the appendices. All budgets, including foreign contributions, must be in U.S. dollars.

4.2.2 Executive Summary (Volume I)

Volume I should consist of a mission summary providing an overview of all aspects of the investigation. This summary should be presented in five parts reflecting the major sections of Volumes II and III (Science, Technical Approach, Opportunity, Cost, and Management). It is recommended that the Executive Summary be constructed by writing abstracts of each of the five major sections. The Executive Summary should serve as the Introduction and Summary for both Volumes II and III. In addition, a "fact sheet" consisting of a single summary page (described in Appendix D) should be included with Volume I.

4.2.3 Science and Technical Approach (Volume II)

The Science and Technical Approach (Volume II) must provide a clear statement of the scientific objectives of the mission and a description of the approach to be used in attaining those objectives. This plan should contain enough background information to be meaningful to a reviewer who is generally familiar with the field, although not necessarily a specialist. The Science and Technical Approach will, itself, be divided into three sections: "Science," "Technical Approach," and "Opportunity." The outline and detailed information regarding the content of these sections are included in Appendix D.

4.2.4 Cost and Management Plan (Volume III)

The Cost and Management Plan (Volume III) must provide a clear statement of all costs associated with the investigation, along with the management approach to be used in attaining the investigation objectives. The Cost and Management Plan will, itself, be divided into two sections: "Cost" and "Management." The outline and detailed information regarding the content of these sections are included in Appendix D.

Additional instructions, guidelines, and other information regarding proposal format and proposal preparation are provided in the Appendices of this AO.

4.2.5 Instructions for Investigations Commencing with Phase B or C/D

In some cases, proposers may consider their mission concepts to be of sufficient maturity to proceed directly to the Phase B definition study or into Phase C/D design and development. These proposers should indicate this clearly in the Executive Summary and should provide supporting documentation in Volumes II and III as follows:

- (1) Wherever the instructions in this AO or its appendices request information on the proposed approach to the Phase A and/or B study the proposal should, instead, document the actual approach taken and the results satisfying the technical requirements outlined in Section 3. Final reports for these Phase A and B studies may be included as appendices, if available.

- (2) Wherever the instructions in this AO or its appendices request a proposed cost for the Phase A and/or B study, the proposal should, instead, document the actual costs expended in the course of the study(ies), to the extent possible.

Documentation of the actual approaches used and costs expended in support of these Phase A and/or Phase B studies in Volumes II and III should be consistent with the proposal page limit and format constraints described in Section 4.2.

4.3 Proposal Submission Information

In order to allow for recycling of proposals after the review process, please submit all proposals and copies on plain white paper only (e.g., no cardboard stock or plastic covers; no colored paper etc.). Photographs and color figures are permitted if printed on recyclable white paper only. (Note that photographs and other special paper products may be included within appendices to the proposal.) The original signed copy (including cover page, signature page(s), certifications, nondomestic endorsements, and Volumes I, II, and III) should be bound in a manner that makes it easy to disassemble for reproduction. Two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits.

4.3.1 Certification

The original copy of all proposals shall include a signature page(s) signed by an institutional official from each organization represented on the team authorized to certify institutional support and sponsorship of the investigation as well as concurrence in the management and financial parts of the proposal. This requirement includes all nondomestic organizations. Additional certifications identified in Appendices I, J, and K are required by law and must also be included.

4.3.2 Quantity

All proposers must provide 25 copies of their proposal, including the original signed proposal, on or before the proposal deadline. The proposals must be numbered sequentially from 1 to 25 in the upper right-hand corner of the cover page of each Volume; the original signed proposal should be number 1. The original and all copies should be submitted in two bound packages consisting of (1) Volume I and Volume II, plus associated appendices; and (2) Volume I and Volume III, plus associated appendices.

4.3.3 Submittal Address

Proposal log-in shall be handled by the Lunar and Planetary Institute (LPI). Proposals must be mailed to the following address:

Lunar and Planetary Institute
Discovery Mission AO
Ref.: NASA AO No. 94-OSS-03
3600 Bay Area Boulevard
Houston, Texas 77058-1113

Phone Number: 713-486-2151

For proposals that include non-U.S. institutions, follow the guidelines cited in Section 4.4.

4.3.4 Deadline

Proposals must arrive at the LPI on or before 4:30 p.m. Central Daylight Time, October 21, 1994. All proposals must be received before the established closing date; those received after the closing date will be treated in accordance with NASA's provisions for late proposals (FAR Supplement 18-15-412, paragraphs A and B).

4.3.5 Notification

NASA will notify the proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact the Discovery Program Manager at the address given in Section 4.1.2.

4.3.6 Proposal Checklist

A checklist summarizing the proposal preparation process and the Discovery mission cost and schedule restrictions is included in Appendix A.

4.4 Proposals Involving International Participation

The procedures for submission of proposals with nondomestic participants are the same as those for strictly domestic proposals, as outlined in Section 4.3. Additionally, one copy (over and above the 25 copies identified in Section 4.3.2) of any proposal that includes nondomestic participants, nondomestic letters of endorsement, and/or institutional and governmental commitments (see Section 4.4.1 below), should be sent to Ms. Helen Lambert at the address listed in paragraph 4.1.4.

4.4.1 Nondomestic Letters of Endorsement

Participation by nondomestic institutions as team members or contributors to proposed investigations must be endorsed by the institutions and governments involved and their commitment documented. These endorsements must extend to all aspects of the proposal involving nondomestic participation, including contributed costs. If review and endorsement of the proposal is not possible before the announced closing date,

the proposer may, in exceptional situations, forward the proposal without endorsement(s) along with the date when a decision on endorsement can be expected. Nevertheless, endorsements must be submitted to Code IRD and to the LPI (Section 4.3.3), even if not included with the proposal. The latest date on which endorsements from nondomestic agencies will be accepted is November 21, 1994.

5.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

5.1 Evaluation Criteria

Successful implementation of the Discovery Program requires, in addition to scientific merit, that the investigation/mission be achievable within established boundary conditions of cost and schedule.

The information requested in Appendix D will enable the evaluation panel to determine how well each mission team understands the complexity of their proposed mission, its technical risks, and any weaknesses which require specific action during Phases A and B. This information will also enable the evaluation panel to rank the proposed investigations, and will provide the necessary discriminators to permit the selection of those proposals which have best met all guidelines and constraints, and addressed all elements viewed necessary for mission success.

Proposals to this announcement will be evaluated in a manner that provides emphasis on Cost and Management equivalent to that of Science, Technical Approach and Opportunity. Volume III (Cost and Management) will have approximately the same importance as Volume II (Science, Technical Approach and Opportunity) in the evaluation process.

Within Volume II, Science will be rated at approximately the same weight as the combination of Technical Approach and Opportunity. Technical Approach will be weighted significantly greater than Opportunity. In Volume III, Cost will be more important than Management. There will be separate scores for Volume II and Volume III, which together will contribute to a basis for selection or rejection.

A general description of evaluation criteria for each of these five areas follows. The degree to which a proposed Discovery investigation meets the various criteria will be determined by the evaluators, and an adjectival grade will be assigned. These adjectival ratings will be used to determine a score for that entire area (e.g., science, cost, etc.).

5.1.1 Evaluation Criteria for Volume II (Science and Technical Approach)

5.1.1a Science Evaluation Criteria

In the Science section, the information requested in the proposal will be used to rate each mission for its scientific merit, feasibility, resiliency and the probability of success. To evaluate the intrinsic merit, the mission goals and objectives will be compared against the planetary science community's latest recommendations to determine the impact of the mission on science as a whole and in particular on the US' planetary

science program. This evaluation will include how well the mission fills important knowledge gaps or provides for evolutionary progress in a sub-discipline and whether or not it provides ancillary benefits to science. In addition, the timeliness of releasing the data to the public domain will be considered. Feasibility will be determined by evaluating the degree to which the mission will address the stated scientific goals and objectives; the degree to which the instrument set can provide the necessary data; and the approach to archiving the data in the PDS. The differences between the baseline mission and the performance floor will be assessed in order to determine the mission's resiliency in the event that development problems lead to reductions in scope. Risk mitigation plans and margins will also be considered. Finally the probability of success will be determined by evaluating the experience, expertise, and organization of the science team and the technical risk associated with the mission design and the instrument set.

5.1.1b Technical Approach Evaluation Criteria

In the Technical Approach section, the evaluation will consider the proposers' understanding of the processes, products, and activities required to accomplish development of all elements (e.g., flight system, ground and data systems, etc.) required to execute the mission and the adequacy of the proposed approach. The technical approach will be examined in its entirety to ensure that: (1) all elements and processes are addressed; (2) weaknesses and design issues are understood and plans for resolution have been identified; (3) fundamental design trades have been identified and studies planned; and (4) primary performance parameters have been identified and minimum thresholds established. The overall approach (including schedule), the specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. Resiliency and margins will be a consideration in the evaluation. The experience and expertise of the development organizations will be considered in determining the probability of success. In addition, innovative, cost effective features, processes, or approaches will be rewarded if shown to be sound.

5.1.1c Opportunity Evaluation Criteria

The information provided in the Opportunity section will demonstrate the proposers' plans for technology infusion and transfer, educational program activities, public information programs, and opportunities for small and small disadvantaged businesses. The evaluation will consider the proposed advanced technologies, their benefits for the mission and their applicability and transferability to other organizations, including the commercial sector. Educational program activities will be evaluated on their potential impact on different educational levels and public information programs will be evaluated on their potential to excite and involve the public. Finally, each proposal evaluation will consider the degree to which small and small disadvantaged business goals are expected to be met. All of these areas will be evaluated on their relevance to the current NASA and National strategies, as well as on the plans for monitoring and assessing progress in these areas.

5.1.2 Evaluation Criteria for Volume III (Cost and Management Plan)

5.1.2a Cost Evaluation Criteria

The information provided in the Cost section will be evaluated on both their absolute values and the quality of the estimates. The quality will be determined by the soundness, completeness, and maturity of the estimates, as well as the planned financial resiliency. The estimate rationales, the development schedule, and probable cost to NASA will be used to assist this evaluation.

5.1.2b Management Evaluation Criteria

The information provided in the Management Section will demonstrate the proposers' plans, processes, and organization for managing and controlling the development and operation of the mission and will be evaluated on the soundness and completeness of the approach and the probability that the management team can assure mission success. The soundness and completeness of the approach will be determined by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making process) and the processes, plans, and strategies the team will use to manage the various mission elements. Criteria will include: clear lines of authority; clean interfaces; prudent scheduling and cost control mechanisms and review processes; demonstrated awareness of all necessary management processes, etc. The probability of mission success will consider the experience, expertise, and commitment of key personnel, as well as the organizations to which they are attached; the adequacy of facilities and equipment proposed for the mission; the adequacy of the team's approach to risk management, including descoping options; and the adequacy of the management and control mechanism. Innovative management processes and plans which are shown to improve performance and reduce costs will be rewarded.

5.2 Evaluation and Selection Process

All proposals will be subjected to a preliminary screening to determine their responsiveness to the constraints and guidelines of this AO (see Appendix B). Those PI's whose proposals are not considered responsive to the constraints and guidelines of the AO will be informed of this determination within several weeks of submission.

The scientific and technical aspects (Volume II) of each proposal will then be assessed by a panel composed of individuals who are scientific and technical peers of the proposers. Concurrently, the implementation aspects (management and cost, Volume III) will be assessed by a separate panel of technical, management, and cost experts. The purpose of these evaluations will be to determine the merits of the scientific, technical, and implementation plan, and to assess the feasibility of each proposal, expressed in terms of its strengths and weaknesses, and to provide a numerical score for each proposal volume.

After these evaluations, the two panels will meet to consider the total quantitative and qualitative aspects of the evaluations in order to integrate the separate panel results and to define the competitive range. The competitive range shall include all proposals

that have a reasonable chance of being selected for award. When there is doubt as to whether a proposal is in the competitive range, it shall be included.

In addition to identifying the competitive range, the evaluation panel may also prepare questions of clarification for the proposals in the competitive range. The identification of the proposals within the competitive range, the questions of clarification, and the evaluation reports for all proposals will represent the final product of the combined evaluation panel. The Discovery Program Office will send a letter to all proposers notifying them of those proposals in the competitive range. Questions of clarification, if any, for all proposals in the competitive range will be transmitted at this time to the appropriate proposers for response within two weeks.

The Executive Committee of the combined panel, composed of a subset of the entire panel, will review the answers to the questions and develop a recommendation for investigations to be selected. This recommendation, and information on all the proposals, will be forwarded to the Space Science Steering Committee (SSSC) for an independent review of the selection process. After this review, the final recommendation will be forwarded to the Associate Administrator for Space Science who will make the final selection. The selected missions will be subject to a competitive down selection at the end of Phases A and B, in accordance with paragraph 5.3.2. In addition, the Associate Administrator for Space Science may select a small mission (one with total mission costs less than \$150 million) to proceed directly to launch (down selection is waived), if such a mission is proposed which is sufficiently well defined to allow a launch near the end of 1998.

Proposers should recognize that SSED program planning is an evolving activity, dependent upon Administration policies and budgets, as well as planetary exploration objectives and priorities that can change with time. The SSED develops and evaluates the program strategy in consultation with the scientific community directly and via advisory groups such as NASA's Solar System Exploration Subcommittee (SSES) and the National Academy of Sciences' Committee on Planetary and Lunar Exploration (COMPLEX).

Certain key provisions concerning selections are also given in Appendix C.

5.2.1 Evaluation of Investigations Proposed to Start in Phase B or C/D

The evaluation of investigations proposed to commence in Phase B or Phase C/D will be no different from the evaluation of other Discovery Mission proposals with two exceptions: (1) The evaluation panel will review the approach taken in the Phase A and/or Phase B studies performed to date and the results of those studies; and (2) The selection and approval of such an investigation by the Associate Administrator for Space Science will be considered "tentative" or "conditional," subject to revision after the review process described in Section 5.3.3.

5.3 Post Selection Activities

5.3.1 Contract Administration and Funding

Contract administration and funding will depend upon the teaming arrangements of selected missions. In some cases, investigators may be funded via contracts administered by NASA Headquarters, or, if a NASA Center is included in a team's proposal, NASA may choose that Center to be the contracting office. Other options may be considered.

It is anticipated that, for the missions selected as a result of this AO, contracts will be written for Phase A studies, with costed options included for the Phase B study, the Phase C/D design and development, and the Phase E mission operations. NASA's decision to exercise options on these contracts will be based upon the results of reviews that take place at the conclusion of Phases A and B and programmatic considerations (see Section 5.3.2). In no case is NASA required to exercise any option.

5.3.2 Confirmation of Investigations for Subsequent Phases

At the completion of the Preliminary Analysis study (Phase A), the Associate Administrator for Space Science will confirm a subset of the selected missions for the Definition study (Phase B). This decision will be based upon review of the Preliminary Analysis study results and programmatic considerations. As a minimum, these reviews will consider the following for each of the selected missions: the technical mission plan; the management plan; the project implementation plan/schedule describing how the technical mission plan is to be accomplished; the implementation plans and technical specifications for mission and system engineering, flight and ground systems, instruments and science, ground data systems, and mission operations systems; and cost estimates. Projects completing the Definition study (Phase B) will similarly be reviewed in order to determine whether they should proceed to the Design/Development phase (Phase C/D). The criteria for confirmation for Phase B and Phase C/D will be essentially the same as the selection criteria, with the addition of investigator team performance during the preceding phase(s).

5.3.3 Direct Selection of Investigations for Phase B or C/D

As discussed in Section 5.3.2, NASA review and approval are required before a mission may proceed from Phase A to Phase B or from Phase B to Phase C/D. Should an investigation that seeks to proceed directly into Phase B or Phase C/D be tentatively selected by the Associate Administrator for Space Science as a result of this AO, the Discovery Program Office may convene a review board to examine the results of the selected investigation's Phase A and/or Phase B study and determine whether the investigation should be permitted to proceed to the next phase. Based on the findings of this review, NASA shall negotiate a contract with written options as described in Section 5.3.1, commencing with either Phase A, Phase B, or Phase C/D.

6.0 CONCLUSION

The Discovery Program represents a challenging new way for NASA to accomplish important scientific exploration of the solar system. It will provide an opportunity for frequent flights to execute science investigations at the forefront of planetary science, as well as generate an opportunity to develop and fly new technologies. NASA invites both the U.S. and international science communities to participate in proposals for Discovery missions to be carried out as a result of this Announcement.



Wesley T. Huntress, Jr.
Associate Administrator for
Space Science

APPENDIX A **PROPOSAL CHECKLIST**

DATE	ACTION	√
August 18, 1994	Deadline for written questions for the pre-proposal briefing submitted to Discovery Program Manager (Section 4.1.3).	
September 2, 1994	Deadline for Notices of Intent (NOIs) to be submitted to Discovery Program Scientist (Section 4.1.4) (ALL POTENTIAL PROPOSERS).	
	Deadline for Notices of Intent (NOIs) to be submitted to NASA International Relations Division (Section 4.1.4) (ONLY POTENTIAL PROPOSERS WITH NON-U.S. TEAM MEMBERS).	
October 21, 1994	Deadline for receipt of <u>an original and 24</u> copies of each proposal at the Lunar and Planetary Institute (Sections 4.3.2 and 4.3.3) (ALL PROPOSERS).	
	Deadline for receipt of one copy of each proposal at NASA International Relations Division (Section 4.4) (ONLY PROPOSERS WITH NON-U.S. TEAM MEMBERS).	
	Is Volume I at the front of Vol. II and Vol. III?	
	Does the proposal conform to the format and outlines described in Section 5.1?	
	Does the original proposal include: - a cover page, - a signature page (or pages), - foreign endorsements, and - all certifications required by law (Section 4.3.1)?	
	Are all 25 copies numbered from 1-25, with the original copy #1?	
November 21, 1994	Deadline for receipt of <u>foreign ENDORSEMENTS</u> at NASA International Relations Division and at LPI (Section 4.4) (ONLY PROPOSERS WITH NON-U.S. TEAM MEMBERS).	

APPENDIX B
SUMMARY OF MAJOR COST, SCHEDULE, AND MISSION
CONSTRAINTS AND GUIDELINES

- Cost to the SSED for Design/Development (Phase C/D) is less than or equal to \$150 million and Mission Operations and Data Analysis (Phase E) is less than or equal to \$35M in FY1992 dollars. Phase E costs greater than \$35M are permitted if Phase C/D costs are reduced accordingly. **[CONSTRAINT]**
- Proposals must be for complete missions only, and must address all Phases from A through E. **[CONSTRAINT]**
- RTGs may not be used in Discovery Missions proposed in response to this AO. **[CONSTRAINT]**
- Proposals must include an estimate for the total mission cost that includes all pre-development study costs, development costs, launch vehicle costs, mission operations and data analysis costs, and mission-unique Deep Space Network (DSN) facility or capability and/or ground communications systems costs. **[GUIDELINE]**
- Contributions by domestic or foreign partners are permitted and may be applied to any phase or phases of a mission. **[GUIDELINE]**
- All contributed goods and services must be included in any calculation or discussion of the total mission costs at the same level of detail as those purchased or procured by the mission team. **[GUIDELINE]**
- The sum total of contributions may not exceed approximately one-third of the Phase C/D cost to NASA. **[GUIDELINE]** The cost of launch vehicles contributed by foreign or domestic organizations are exempted from this requirement.
- Investigations must use a NASA-provided medium (Delta II) class or smaller launch service for missions in which there is no cooperative exchange involving a launch vehicle, unless a U.S. service is included within the Phase C/D proposed cost. **[CONSTRAINT]** The use of a larger U.S. or non-U.S. vehicle will be permitted only if it is contributed by a domestic or foreign partner.
- Missions must launch within 35 months of the start of Phase C/D (Design/Development). **[CONSTRAINT]**
- Investigations proposed in response to this Announcement of Opportunity should have launch dates prior to August 31, 1999. **[GUIDELINE]** Exceptions for launches that take place prior to August 31, 2001 may be permitted in cases where celestial mechanics dictate a launch window that is outside of this guideline if it is within the scope of NASA's programmatic and budgetary constraints. Investigations with launch dates later than August 31, 2001 will not be accepted in response to this AO. **[CONSTRAINT]** Such investigations may be proposed in response to subsequent AOs.

APPENDIX C GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point.

III. SELECTION WITHOUT DISCUSSION

The Government intends to evaluate proposals and award contracts without discussions with offerors. Therefore, each initial offer should contain the offeror's best terms from a cost or price and technical standpoint. However, the Government reserves the right to conduct discussions if later determined by the Contracting Officer to be necessary.

IV. NON-DOMESTIC PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Section 3.2 shall also apply.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or

quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

Submission of a Standard Form (SF) 1411 "Contract Pricing Proposal Cover Sheet" (included on page C-3) for Phase A is required as part of the cost proposal. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution will be required to resubmit or execute all certifications and representations required by law and regulation.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, if the selecting official deems it to offer NASA a significant technical advantage or cost reduction. (See NFS 18-15.412.)

VIII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the

CONTRACT PRICING PROPOSAL COVER SHEET

1. SOLICITATION/CONTRACT/MODIFICATION NO.

FORM APPROVED OMB NO.

9000-0013

Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition Policy, GSA, Washington, D.C. 20405, and to the Office of Management and Budget, Paperwork Reduction Project (9000-0013), Washington, D.C. 20503.

NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))

2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT

3B. TELEPHONE NO.

4. TYPE OF CONTRACT ACTION (Check)

☐ A. NEW CONTRACT☐ D. LETTER CONTRACT☐ B. CHANGE ORDER☐ E. UNPRICED ORDER☐ C. PRICE REVISION/
REDETERMINATION☐ F. OTHER (Specify)

5. TYPE OF CONTRACT (Check)

☐ FFP☐ CPFF☐ CPIF☐ CPAF☐ FPI☐ OTHER (Specify)

6. PROPOSED COST (A+B=C)

A. COST

B. PROFIT/FEE

C. TOTAL

\$

\$

\$

7. PLACE(S) AND PERIOD(S) OF PERFORMANCE

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary, use same headings.)

A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.

9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (if available)

A. CONTRACT ADMINISTRATION OFFICE

B. AUDIT OFFICE

10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "yes," identify)

☐ YES☐ NO

11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete item 11B)

☐ YES☐ NO

11B. TYPE OF FINANCING (✓ one)

☐ ADVANCE PAYMENTS☐ PROGRESS PAYMENTS☐ GUARANTEED LOANS

12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))

☐ YES☐ NO

13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31, COST PRINCIPLES? (If "No," explain)

☐ YES☐ NO

14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)

A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)

☐ YES☐ NO

B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or 2)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)

☐ YES☐ NO

C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)

☐ YES☐ NO

D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)

☐ YES☐ NO

This proposal is submitted in response to the RFP, contract, modification, etc. in item 1 and reflects our best estimates and/or actual costs as of this date and conforms with the instructions in FAR 15.804-6(b) (2), Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or an authorized representative the right to examine, at any time before award, those books, records, documents and other types of factual information, regardless of form or whether such supporting information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.

15. NAME AND TITLE (Type)

16. NAME OF FIRM

17. SIGNATURE

18. DATE OF SUBMISSION

evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

By submitting a proposal, the investigator and institution agree to accept the following clause in any resulting contract:

EQUAL OPPORTUNITY

During the performance of this contract, the Contractor agrees as follows:

- A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- B. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to (a) employment; (b) upgrading; (c) demotion; (d) transfer; (e) recruitment or recruitment advertising; (f) layoff or termination; (g) rates of pay or other forms of compensation; and (h) selection for training, including apprenticeship.
- C. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, the notices to be provided by the Contracting Officer that explain this clause.
- D. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- E. The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- F. The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- G. The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any

successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

H. The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

I. If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

J. The Contractor shall include the terms and conditions of subparagraph 1 through 9 of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

K. The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the U.S. to enter into the litigation to protect the interests of the U.S.

XI. PATENT RIGHTS

A. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, "New Technology," shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, "Requests for Waiver of Rights to Inventions."

B. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, "Patent Rights--Retention by the Contractor (Short Form)" (as modified by NFS 18-52.227-11) shall apply.

XII. RIGHTS IN DATA - LIMITED EXCLUSIVE RIGHTS (January 1992)

Any contract resulting from this Discovery Missions AO will contain the following "Rights in Data" clause:

(A) Definition

"Computer software," as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data," as used in this clause, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited exclusive rights," as used in this clause, means the rights of the Government and others acting on its behalf to use, duplicate, and disclose for Government purposes, the rights of the Contractor to use, duplicate, and disclose for its purposes within the United States, and the rights of other entities designated or approved by the Government to use and duplicate (but not to further disclose) for their purposes within the United States, provided that in all instances the data are made subject to disclosure restrictions that protect and preserve its limited exclusive rights.

"Limited exclusive rights data," as used in this clause, means technical data (including system studies and computer source programs and code) first produced in the performance of this contract that have been specifically identified in this contract (either at the time of contract or subsequently by amendment) as subject to limited exclusive rights, provided such data are not generally known, or such data have not without obligation as to its confidentiality been made available to others by the Contractor or are not already available to the Government. The limited exclusive rights of the Government, the Contractor, and other entities regarding the disclosure and use of such data are as set forth in subparagraph (g)(4) of this clause.

"Limited rights," as used in this clause, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of subparagraph (g)(2) if included in this clause.

"Limited rights data," as used in this clause, means data (other than computer software) developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged.

"Restricted computer software," as used in this clause, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software; including minor modifications of such computer software.

"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of subparagraph (g)(3) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software

"Technical data," as used in this clause, means data (other than computer software) which are of a scientific or technical nature.

"Unlimited rights," as used in this clause, means the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(B) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause regarding copyright, the Government shall have unlimited rights in -

- (i) Data first produced in the performance of this contract unless provided otherwise for limited exclusive rights data in accordance with subparagraph (g)(4) of this clause;
- (ii) Form, fit, and function data delivered under this contract;
- (iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training materials for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and
- (iv) All other data delivered under this contract unless provided otherwise for limited rights data, restricted computer software, or limited exclusive rights data in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to -

- (i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause or in subparagraph (g)(4) of this clause;

- (ii) Protect from unauthorized disclosure and use those data which are limited rights data, restricted computer software, or limited exclusive rights data, to the extent provided in paragraph (1) of this clause;
- (iii) Substantiate use of, add or correct limited rights, restricted rights, limited exclusive rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and
- (iv) Establish claim to copyright subsisting in data first produced in the performance of this contract to the extent provided in subparagraph (c)(1) of this clause.

(C) Copyright.

(1) Data first produced in the performance of this contract.

Unless provided otherwise in paragraph (d) of this clause, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the Contracting Officer is required to establish claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Contractor grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

(2) Data not first produced in the performance of this contract.

The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contains the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause;

provided, however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(3) of this clause if included in this contract or as otherwise may be provided in a collateral agreement incorporated in or made part of this contract.

(3) Removal of copyright notices.

The Government agrees not to remove any copyright notices placed on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(D) Release, publication and use of data.

(1) The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph, in paragraph (g) of this clause or as expressly set forth in this contract.

(2) The Contractor agrees that to the extent it receives or is given access to data necessary for the performance of this contract which contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the Contracting Officer.

(3) The Contractor agrees not to establish claim to copyright or publish or release to others any computer software first produced in the performance of this contract other than pursuant to subparagraph (g)(4) of this clause without the Contracting Officer's prior written permission.

(E) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in subparagraph (g)(2), (g)(3), or (g)(4) of this clause and use of such is not authorized this clause, or if such data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer shall make written inquiry to the Contractor affording the Contractor 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the

Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in subdivision (e)(1)(i) of this clause, the Contracting Officer shall consider such written justification and determine whether or not the markings are to be canceled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor shall be so notified in writing. If the Contracting Officer determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer shall furnish the Contractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government shall continue to abide by the markings under this subdivision (e)(1)(iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in subparagraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) This paragraph (e) does not apply if this contract is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard agency subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

(4) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by this paragraph (e) from bringing a claim under the Contract Disputes Act, including pursuant to the Disputes clause of this contract, as applicable, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(F) Omitted or incorrect markings.

(I) Data delivered to the Government without either the limited rights, restricted rights, or limited exclusive rights notice as authorized by paragraph (g) of this clause, or the copyright notice required by paragraph

(c) of this clause, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Contractor's expense, and the Contracting Officer may agree to do so if the Contractor -

- (i) Identifies the data to which the omitted notice is to be applied;
- (ii) Demonstrates that the omission of the notice was inadvertent;
- (iii) Establishes that the use of the proposed notice is authorized; and
- (iv) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

(2) The Contracting Officer may also (i) permit correction at the Contractor's expense of incorrect notices if the Contractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(G) Protection of limited rights data, restricted computer software, and limited exclusive rights data.

(1) When data other than that listed in subdivisions (b)(1)(i), (ii), and (iii) of this clause are specified to be delivered under this contract and qualify as either limited rights data or restricted computer software, if the Contractor desires to continue protection of such data, the Contractor shall withhold such data and not furnish them to the Government under this contract. As a condition to this withholding, the Contractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government are to be treated as limited rights data and not restricted computer software.

(2) [Reserved]

(3) [Reserved]

(4) (i) Notwithstanding any other provisions of this clause, the contract may specify or NASA may require by written request that any data first produced in the performance of this contract be delivered to NASA or furnished to others in accordance with (iii)(a) below, and if so specified or required, the Contractor shall affix the following "Limited Exclusive Rights Notice" to data that are identified in this contract as

limited exclusive rights data prior to delivery to the Government or prior to release to others by the Contractor:

LIMITED EXCLUSIVE RIGHTS NOTICE

These data are subject to limited exclusive rights under Government contract No.....(and subcontract, if appropriate.) These data may be: used, duplicated, and disclosed by or on behalf of the Government for Government purposes; used, duplicated, and disclosed by or on behalf of the Contractor for its purposes within the United States; and used and duplicated (but not further disclosed) by other recipients that have been designated or approved by NASA as participants in the program of which this contract is a part for their purposes within the United States with the express limitation that any release or disclosure for any of the foregoing purposes are to be made subject to disclosure conditions that protect and preserve its limited exclusive rights. These limited exclusive rights shall be effective until (insert a date certain.) No other disclosure and use of these data is authorized without the written permission of (insert name of contractor or subcontractor.) This Notice shall be marked on any reproduction of these data, in whole or in part.

(End of Notice)

- (ii) The Contractor is to place the Limited Exclusive Rights Notice on limited exclusive rights data as soon as practicable after the data is reduced to some tangible, recorded form as defined by the term "data" in this clause, but in any event no later than the earlier of either the date of delivery to NASA if delivery is requested, or of release of data. The "date certain" to be inserted in the Notice, indicating the period of limited exclusive rights, shall be 5 years from the date the Notice is placed on the data, unless otherwise agreed to and stated with respect to any item, component, process, or computer software specifically identified in this contract.
- (iii) The Contractor agrees:
 - (a) to make limited exclusive rights data available to any other entity designated or approved by NASA as a participant in the program of which this contract is a part, either as specifically designated in this contract or as subsequently approved and directed in writing by NASA;
 - (b) obtain written affirmation that any entity receiving limited exclusive rights data pursuant to (a) above will abide by the use, duplication, and disclosure prohibitions of the Limited Exclusive Rights Notice; and

(c) not to authorize any disclosure and use of limited exclusive rights data than as set forth in the Limited Exclusive Rights Notice without the concurrence of NASA.

(H) Subcontracting.

(1) The Contractor has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government such rights, the Contractor shall promptly bring such refusal to the attention of the Contracting Officer and not proceed with subcontract award without further authorization.

(I) Relationship to patents.

(1) Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

(2) Nothing in this clause shall restrict the rights of the contractor under the New Technology clause of this contract.

(J) Immigrant Aliens.

(1) For the purpose of this clause, disclosure of "limited exclusive rights data" to Immigrant Aliens in the course of their employment by the Contractor shall not be interpreted as disclosure outside the United States. An immigrant alien is defined as "any person lawfully admitted in the United States under an immigration visa for permanent residence.

XIII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING GOALS

Offerors, other than small businesses, proposing investigations will be required to submit and negotiate a subcontracting plan consistent with the requirements of FAR 52.219-9, Small Business and Small Disadvantaged Business Subcontracting Plan. The Government's mandatory separate goals, as percentages of total subcontract dollars, for subcontracting or otherwise teaming with small businesses and minority concerns are specified below. Minority concerns include small businesses or other organizations owned and controlled by socially and economically disadvantaged individuals, which include women, historically Black colleges and universities, and other minority educational institutions. "Historically Black Colleges and Universities," means institutions determined by the Secretary of Education to meet the requirements of 34 C.F.R. section 608.2 and listed therein. "Minority educational institutions" means institutions determined by the Secretary of Education to meet the requirements of 34 C.F.R. section 637.4. "Socially and economically disadvantaged individuals" has the meaning given such terms in sections 8(a)(5) and (6) of the Small Business Act (15 U.S.C. 637 (a)(5) and (6)) and includes women.

Small Business Subcontracting Goal: 8% of total subcontract dollars

Minority Concern Subcontracting Goal: 8% of total subcontract dollars

(Note: These goals equate to 16% of total subcontract dollars. It is, of course, desirable to exceed the specified goals for Small Business and Minority Concern participation whenever possible.)

For purposes of FAR 52.219-9, planned subcontract dollars for the use of small disadvantaged concerns shall be separately identified.

Notice: The contracting officer is required to prescribe a mandatory goal for small/small disadvantaged businesses. In negotiated acquisitions, an initial proposal will not be rejected as unacceptable solely as a result of an offeror proposing a goal that is less than the mandatory goal. The proposed goals will be evaluated as part of the Opportunity Section of Volume II (Science and Technical Approach). The goals negotiated for inclusion in the contract will be consistent with the subcontracting opportunities available to the contractor and commensurate with the efficient and economical performance of the contract.

APPENDIX D GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals by potential investigators in response to this Discovery Missions AO. The material presented is merely a guide for the prospective proposer, and is not intended to be all encompassing. The proposer should, however, provide information relative to those items applicable or as otherwise required by the AO. In the event of an apparent conflict between the guidelines in this appendix and those contained within the body of the AO, those within the AO shall take precedence.

A. COVER PAGE

A cover page must be forwarded with the proposal. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization that is responsible for the proposal and its contents. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, shall be included.

B. SIGNATURE PAGE

A signature page must also be forwarded with the proposal, immediately following the cover page. It must identify the Principal Investigator, the Project Manager, all Co-Investigators and lead representatives from every organization represented on the team, as well as the authorizing official from each organization represented on the team who is authorized to commit that institution to the proposed investigation. The signatures of these individuals must be included on a signature page, along with their full names, titles, affiliations, and addresses. Should it not be feasible to have all individuals sign the same sheet due to time or page constraints, more than one sheet may be used to enable concurrent signatures. Figure D1 provides the format to be followed in preparing the signature page(s).

C. TABLE OF CONTENTS

The proposal shall contain a table of contents. This table of contents should parallel the outlines provided below to the greatest extent possible.

D. VOLUME I - EXECUTIVE SUMMARY

VOLUME I EXECUTIVE SUMMARY

The Executive Summary should provide an overview of the investigation, including its scientific objectives, technical approach, educational, technological, and societal opportunities, cost plan, and management plan. This introduction and summary should be no longer than five (5) pages and should be included in its entirety at the beginning of both Volumes II and III.

In addition, a separate "Fact Sheet" that provides a brief summary of the proposed investigation should be included with the Executive Summary. The information conveyed on this fact sheet should include the following: major mission characteristics, mission objectives, science payload, key spacecraft characteristics, mission management (including organization of team), cost, schedule, and mission cost and schedule reserves. Other relevant information, including figures or drawings, may be included at the proposers' discretion. Mission fact sheets for the NEAR and Mars Pathfinder missions are included in the DPL described in section 4.1.1.

E. VOLUME II - SCIENCE AND TECHNICAL APPROACH

VOLUME II SCIENCE AND TECHNICAL APPROACH

I. EXECUTIVE SUMMARY [Volume I]

II. SCIENCE

The science section should contain the following:

- A. Scientific Goals and Objectives. This section should consist of a brief definition of the goals and objectives of the investigation, their value to solar system exploration and planetary science in general, and their relationships to past, current, and future investigations and missions. It should describe the history and basis for the proposal and discuss the need for such an investigation.
- B. Nature of Investigation. This section should consist of a brief overview of the mission, identifying the target, the mission type (Earth-orbital, flyby, rendezvous, lander, sample return, etc.), basic encounter geometry, and prime mission lifetime. A more detailed description of the mission approach should be included in Section III, "Technical Approach."
- C. Measurement Objectives and Anticipated Data Return. This section should fully describe the measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation. This description should identify the experiments to be performed (imaging, spectroscopy, chemical analysis, sample return, etc.), the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (bits, images, sample mass, volume, etc.). The relationship between the data products generated and the scientific objectives should be explicitly described, as should the expected results. It is assumed that the above information will constitute the "Baseline Mission."

FIGURE D1
Sample Signature Page

Investigation Title:		
Principal Investigator:		
Project Manager:	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation, Address</div>	
Co-Investigator "A":	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "A", Address</div>	
Authorizing Official "A" :	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "A", Address</div>	
Co-Investigator "B":	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "B", Address</div>	
Authorizing Official "B" :	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "B", Address</div>	
Co-Investigator "C":	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "C", Address</div>	
Authorizing Official "C" :	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "C", Address</div>	
Lead Representative "D":	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "D", Address</div>	
Authorizing Official "D" :	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "D", Address</div>	
Lead Representative "E":	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "E", Address</div>	
Authorizing Official "E" :	<div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;">(signature)</div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Name Date </div> <div style="border-bottom: 1px solid black; height: 1.2em; margin-bottom: 0.2em;"></div> <div style="text-align: center;">Title, Affiliation "E", Address</div>	

This section must also identify a minimum acceptable data and scientific return for the mission (the "Performance Floor"), below which the mission would not be worth pursuing. Options for descoping the mission from the "Baseline" to the "Performance Floor" should also be included. Proposals should include only one "Baseline" mission and one "Performance Floor." NASA will not consider more than one "Baseline" mission per proposal.

Finally, this section should describe the plan for processing and analyzing the data and delivering it in archival format to the Planetary Data System (PDS). The anticipated format of the final data products should be described.

- D. Instrumentation. This section should fully describe the instrumentation and the criteria used for their selection. It should indicate items that are proposed to be developed, as well as any existing instrumentation or design heritage. Performance characteristics should be related to the measurement and investigation objectives as stated in the proposal. Such characteristics include the preliminary estimates of mass, power, volume, and data rates, fields of view, resolution, precision/sensitivity, pointing accuracy, etc. Information pertinent to the accommodation of the instrumentation on the spacecraft should be included in Section III.C (TECHNICAL APPROACH, Payload Integration).
- E. Science Team. This section should identify the mission science team, and the activities of that team should be described in detail. The capabilities and experience of all members of the proposed science team should be described. In addition, the role of each science team member in the investigation should be explicitly defined. If a Guest Investigator program is to be proposed, the activities of those investigators should be discussed here. Resumes or vitae of team members may be included as attachments to the proposal.

III. TECHNICAL APPROACH

The Technical Approach section should detail the method and procedures for investigation definition, design, development, integration, ground operations, and flight operations. This section should also detail the expected products and end items associated with each phase. Mission teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated. Significant differences in the proposed approach from the activities and products delineated in NHB 7120.5 should be discussed. The experience and qualifications of performing organizations should be discussed. This section must be complete in itself without the need to request additional data.

- A. Mission Design. This section should fully describe the operational phase of the mission from launch to end of mission. It should include information on the proposed launch vehicle, trajectories, Delta-V requirements, encounter geometry (orbiter, flyby, lander, etc.) and characteristics (flyby speed, orbital period, etc.), and a preliminary mission timeline indicating periods of data acquisition, data downlink, etc. The mission design should also describe the

type of Deep Space Network (DSN) (or other communications network) interface.

The rationale that justifies both the cost effectiveness and technical effectiveness of the mission design should be described. A "traceability matrix" showing how the proposed mission design complies with the stated objectives, requirements, and constraints of the proposed investigation should be included. The rationale for the selection of launch vehicle should be included. The proposal should identify any innovative features of the mission design that minimize total mission costs.

- B. Flight System. This section should describe the flight system design approach, particularly as it relates to new versus existing hardware and redundant versus single-string hardware. It should fully identify the flight system and describe its characteristics and requirements. A preliminary description of the flight system design with a block diagram showing the flight element subsystems and their interfaces should be included, along with a description of the flight software and a summary of the estimated performance of the flight system. The flight heritage or rationale used to select the flight system and its subsystems, major assemblies, and interfaces should be described, as well as the reason for their selection.

Subsystem characteristics and requirements should be described to the extent possible. Such characteristics include: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; space qualification plan; and logistics support. These subsystems may include: Structural/mechanical, solar array/power supply (and batteries), electrical, thermal control, propulsion, communications, attitude control, command and data handling, etc. Adequate margins should be identified. Any design features incorporated to effect cost savings should be identified. A summary of the resource elements of the flight system design concept, including key margins, should be provided. The rationale for margin allocation should be provided. Those design margins that are driving costs should be identified.

Plans for all phases of software development or use of existing software (including "commercial off-the-shelf") should be described. The method planned for development and validation of flight software, and the method for resolving any major open flight system issues, major systems trades, and technology development planned to be addressed in Phases A and B should be addressed. A preliminary schedule for the flight system development should be included.

- C. Payload Integration. This section should characterize the interface between the instruments and the flight system. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluents, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system.

- D. Manufacturing, Integration, and Test. This section should describe the manufacturing strategy to produce and test the hardware/software necessary to accomplish the mission. It should include a description of the main processes/procedures planned in the fabrication of flight hardware, software, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program.

The approach, techniques, and facilities planned for integration, test and verification, and launch operations phases, consistent with the proposed schedule and cost, should be described. A preliminary schedule for manufacturing, integration, and test activities should be included. A description of the planned end items, including engineering and qualification hardware, should be included. The use of any existing test facilities and processes should be described.

- E. Ground and Data Systems. This section should discuss the ground operations support required for the proposed investigation. The approach to the development of the ground data system, including the use, if any, of existing facilities should be described. All usage of the Deep Space Network (DSN) and of any existing non-DSN facilities (including TDRSS) should be explicitly described. Any mission-unique facilities must be adequately described. Include a block diagram of the GDS showing the end-to-end concept (acquisition through archiving) for operations and data flow to the subsystem level. Describe all communications, tracking, and ground support requirements. Describe the software development approach and its relationship to the flight system software development.

- F. Mission Operations. This section should describe the planned approach for managing mission operations and all flight operations support, including mission planning. A description of the operational phase of the mission should be included. Operational constraints, viewing requirements, and pointing requirements should also be identified. Describe any special communications, computer security, tracking, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel.

The acquisition of data and the processing of that data both onboard the flight system and on the ground should be described. The data reduction and analysis plan after the data has been delivered to the ground should be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving should be discussed and the plan must include a detailed schedule for the submission of raw and reduced data to the Planetary Data System (PDS) in the proper formats, media, etc. Delivery of the data to the PDS should take place in the shortest time possible.

Specific features incorporated into the flight and ground system design that lead to low-cost operation should be identified. The use of any existing mission

operations facilities and processes should be described, as well as any new facilities required to meet mission objectives.

- G. Product Assurance and Safety. This section should describe the process by which the product quality is assured to meet the customer's specifications, including identification of trade studies, the parts selection strategy, and the plans to incorporate new technology. This section should also describe the product assurance plan, including plans for problem/failure reporting, inspections, quality control, parts selection and control, safety assurance, and software validation.
- H. Phase A/B Preliminary Analysis and Technical Definition Plans. This section should describe the means by which the Preliminary Analysis Study (Phase A) and Technical Definition (Phase B) will be performed. This section should identify the key mission trade-offs and options to be investigated during Phases A and B and should be sure to identify those issues and technologies critical to the mission success. These plans should also define the products of each phase and the schedule for their delivery.

IV. OPPORTUNITY

This section should describe the benefits offered by the mission beyond the scientific benefits brought by obtaining and analyzing the desired data. These benefits may be technological, educational, and/or social.

- A. Technology Infusion. This section should describe those technologies to be considered during the predevelopment phases (Phase A and Phase B) of the investigation for potential application to the mission and their rationale. The methods by which these new technologies will be assessed and their risks reduced, as well as the means to validate these technologies, should be described. Alternative approaches to the use of these new technologies should be identified.

In addition, this section should describe the means by which new technologies are actually applied to the investigation. The rationale for utilizing these new technologies (particularly performance enhancement and/or cost savings) should be described. The risks associated with utilizing these new technologies, and the plans to manage these risks, should be discussed.

- B. Technology Transfer. This section should describe the potential for transfer of new technology from this investigation to other applications in NASA, the Federal Government, and/or in the private sector. The degree to which the proposed technologies could apply to multiple programs or projects should be considered. Plans for performing technology transfer beyond the proposed investigation should also be discussed. The costs associated with this technology transfer and promoting it to the public should be called out in Volume III.

- C. Educational Program Activities. This section should discuss the degree to which this investigation will generate educational opportunities and contribute to the Nation's educational initiatives. The involvement of teachers and/or students in the investigation should be documented here, as should any educational activities to be implemented. Coordination and collaboration with educational institutions should be discussed.
- D. Socio-Economic Benefits. This section should describe the opportunities offered by the investigation for small disadvantaged businesses. It should also describe the breadth of participation in the investigation by members of the industry, academic, not-for-profit, and Federal communities, as well as discussing the opportunities offered by the investigation for other members of these communities. This section should identify the percentage of work, expressed as percentage of total subcontract cost/price and total contract cost/price, to be performed by small businesses (SBs) and small disadvantaged businesses (SDBs).
- E. Public Awareness. This section should describe the degree to which the scientific investigation and discoveries will be communicated to the public.

F. VOLUME III - COST AND MANAGEMENT PLAN

VOLUME III
COST AND MANAGEMENT PLAN

I. EXECUTIVE SUMMARY [Volume I]

II. COST PLAN

The cost plan should provide information on the anticipated costs for all phases of the mission. It should also describe the plans for tracking and controlling costs, or reference the applicable portions of Volume II or the Management Approach section.

The inflation index provided in Appendix E should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the inflation index is used, the rates used should be documented.

- A. Preliminary Analysis (Phase A) Cost Estimate. This section provides a detailed cost proposal for performing the Phase A Study. Detailed plans for the study should be described, but reference may be made to the Technical Approach Section of Volume II.

In completing this section, the following instructions will apply:

1. Contract Pricing Proposal.
 - a. The cost proposal will include, as a summary of total proposed Phase A costs, a completed SF 1411, as included in Appendix C.

- b. The SF 1411 must be signed by the proposer's authorized representative.
2. **Cost Elements Breakdown.** To effectively evaluate the Phase A cost proposal, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal will include, but is not limited to, the following:
- a. **Direct Labor.**
 - (1) Explain the basis of labor-hour estimates for each of the labor classifications.
 - (2) State the number of productive work-hours per month.
 - (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates including the cost centers involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and element included in the rates, such as overtime, shift differential, incentives, allowances, etc.
 - (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
 - (5) If Civil Servant labor is to be used in support of the Phase A study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners (i.e., the sum of such contributions should not exceed approximately one-third of the Phase C/D development cost to NASA).
 - b. **Direct Material.** Submit a breakdown of material and parts, including basis for estimates and sources of supply, if known. Describe any pricing factors added to material prices, such as scrap, rework usage, etc.
 - c. **Subcontracts.** Identify fully each effort (task, item, etc.) to be subcontracted, and list the selected subcontractors, locations, amount proposed and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts.
 - d. **Other Direct Costs.**
 - (1) **Travel, Relocation and Related Costs.**
 - (a) Indicate destination, number of work-trips, duration and purpose. Specify total proposed cost of each trip.
 - (b) Explain or submit current company policy regarding the reimbursement of travel and relocation costs and the accounting treatment of such costs as direct costs or indirect

expenses. Submit copies of Government approvals of such policies, as appropriate.

- (2) Computer. Describe the type of computer, the extent of usage, the rates, and the amounts. Explain where associated labor costs (programmers, operators, etc.) are included in the proposal.
- (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
- (4) Other. Explain and support any other direct costs included in the Phase A proposal in a manner similar to that described above.

e. Indirect Costs.

- (1) List all indirect expense rates and their respective cost centers used in the proposal. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
- (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.
- (3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
- (4) Identify separately any independent research and development expenses included in the G&A rate.

3. Phase A Time-Phased Summary. Prepare a summary of the total Phase A estimated costs summarized by cost elements and time-phased by month. Note that direct labor hours and rates should be shown by category (e.g. engineering, manufacturing, etc.). Overhead (or fringe) applied to this labor may be shown by cost category or in total. Materials amount and subcontract amount should include burdens, as appropriate, and should be shown in total. Other direct costs should be shown in total. G&A and other indirect costs (such as internal research and development charges) should be shown as appropriate.

If the Phase A study has been completed, provide the actual cost data in the same level of detail as requested for estimated costs, to the extent possible.

- B. Technical Definition(Phase B) Cost Estimate. This section provides a cost estimate for performing the Technical Definition (Phase B) study. Plans for the study should be described, but reference may be made to the Technical Approach section of Volume II.

If the Phase B study has been completed, provide the actual cost data in the same level of detail as requested for estimated costs, to the extent possible.

1. In completing this section, the guidelines for Phase A apply except that the Contract Pricing Proposal is **ONLY REQUIRED FOR THOSE INVESTIGATIONS PROPOSED TO BEGIN IN PHASE B.**

C. Design/Development Phase (Phase C/D)

This section provides a detailed cost proposal for performing Design/Development Phase C/D. Plans for the Design/Development phase (Phase C/D) should be described, and a correlation of the costs with the technical approach should be included. Reference may be made to the Technical Approach section of Volume II.

In completing this section, the following guidelines will apply:

1. **Phase C/D Cost Breakdown.** A Cost Breakdown Structure (CBS) for every year of the Design/Development Phase (Phase C/D) must be included in the proposal. This CBS shall be to the subsystem level (level 3) for the flight system, and for all other cost items at least the system level (level 2). The value of all reserves, contributions, the cost of launch vehicles and services, and any facility and equipment costs shall also be included.

The Design/Development phase should be summarized by major elements of cost for each cost category in the CBS. The elements of cost for the Phase C/D cost estimates should include the following, as a minimum:

- a. Direct Labor: List by labor category, with labor hours and rates for each. This should correlate with the workforce staffing plan discussed below in Section 2. If Civil Servant labor is to be used, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners (i.e., the sum of such contributions should not exceed approximately one-third of the Phase C/D development cost to NASA).
- b. Materials: This should give the best estimate of the total cost of the bill of materials. Identify separately the estimated cost of major items, if known.
- c. Subcontracts: List any major subcontracts (anticipated and known), and the basis for estimated costs.

- d. Other Direct Costs: Include launch vehicles and services, facilities and equipment. Any costs that are not covered elsewhere, including insurance, travel, etc., should be itemized here.
 - e. Indirect Costs: This includes all overhead, general and administrative, fee, and any other miscellaneous expenses related to the overall business.
- 2. Provide a preliminary workforce staffing plan which includes all management, technical (scientific and engineering), and support staff by fiscal year.
 - 3. The cost estimate shall include all burdens and profit/fee in real-year dollars by fiscal year, assuming the inflation rates used by NASA (provided in Appendix E) or specifically identified industry forward pricing rates.
 - 4. Provide a description of the cost-estimating model(s) and techniques used in your Phase C/D cost estimate. Discuss the heritage of the models applied to this estimate including any known differences between missions contained in the models and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase C/D cost and identify those which are critical to cost sensitivity in the investigation. Discuss the project risks which result from an uncertainty analysis of the cost estimate and provide the attendant total cost estimate range these risks create. Discuss the methodology by which all cost risks will be identified, tracked, and mitigated by the technical management process applied in this investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.
 - 5. Provide a funding obligation plan for the proposed funding requirements of the investigation by annum keyed to the work schedule.
 - 6. Provide a schedule for accomplishing Phase C/D activities. All funded schedule margin should be identified.
 - 7. Contract Pricing Proposal (ONLY REQUIRED FOR THOSE INVESTIGATIONS PROPOSED TO BEGIN IN PHASE C/D.)
 - a. The cost proposal will include, as a summary of total proposed Phase C/D costs, a completed SF 1411, as included in Appendix C.
 - b. The SF 1411 must be signed by the proposer's authorized representative.

D. Mission Operations Phase (Phase E) Cost Estimate This section provides a cost estimate for performing the Mission Operations for Phase E. Reference may be

made to the Technical Approach section of Volume II. In completing this section, the guidelines for Phase C/D apply.

E. Total Mission Cost (TMC) Estimate. This section should summarize the estimated costs to be incurred in Phases A through E including the following:

1. Preliminary Analysis Study (Phase A).
2. Technical Definition (Phase B).
3. Design and Development Phase (Phase C/D).
4. Mission Operations and Data Analysis Phase (Phase E).
5. Launch vehicle, upper stages, and launch services.
6. Mission-unique costs to the Deep Space Network and other ground system costs.
7. Cost of activities associated with technology transfer and programs for social or educational benefits (if not incorporated in any of Phases A through E).

This section should include:

Detailed plans for all aspects of the mission not discussed elsewhere in this volume, including: the launch vehicle, upper stages, and launch services; Deep Space Network and other ground system; activities associated with technology transfer and programs for social or educational benefits. Reference may be made to the Technical Approach section of Volume II. In completing this section, the following guidelines will apply:

1. **Funding Profile Versus Time.** A summary of the Total Mission Cost time-phased by fiscal year must be included in the format shown in Figure D2. Dollar amounts should be shown in real-year dollars. Total Mission Costs should be summarized in both real-year and FY92 dollars in the last two columns of this table. This summary should represent the optimum funding profile for the mission. Assets provided as contributions by international or other partners should be included, and clearly identified, as separate line items.
2. **Total Mission Cost Breakdown by Institutional Category.** A summary of the total costs to NASA for the investigation, broken down by institutional categories (i.e., educational institutions, industry, non-profit institutions, NASA Centers, and other Government agencies) and using the template in Figure D3, should be included. Participation by small, minority- or women-owned, and/or otherwise disadvantaged businesses should also be highlighted, as should participation by historically black colleges and

universities or by other minority institutions. Indicate the page(s) in the proposal where the participation of each institution is documented.

- F. Tracking and Phasing of Schedule Margins and Cost Reserves. Specific margins and reserves in cost and schedule should be identified by Phase and year and the rationale for them discussed. The specific means by which costs will be tracked and managed should be defined. Specific reserves and the timing of their application, if needed, should be described within the proposal. This should include the strategy for maintaining reserves as a function of cost-to-completion. All funded schedule margins should be identified. The relationship between the use of such reserves, margins, potential descope options, and their effect on cost, schedule, and performance should be fully discussed.

III. MANAGEMENT PLAN

The management plan should summarize the management approach and the facilities and equipment required. This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section should specifically discuss the decision-making process to be used by the team, focusing particularly on the roles of the principal investigator and project manager in that process. The management plan gives insight into the organizations proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members, and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated.

- A. Management Processes and Plans, Schedule, and Procurement Strategy. This section should describe the management processes and plans, schedules, and procurement strategy necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section should also describe the proposed methods of hardware and software acquisition. Specifically, it should include the following, as applicable:

- (1) Unique or proprietary capabilities that each member organization brings to the team, as well as previous experience with similar systems and equipment.
- (2) Management processes which the investigator team proposes to:
 - (a) develop and maintain the hardware and software requirements and specifications;
 - (b) manage and control development progress;
 - (c) manage and conduct technology development;

FIGURE D2
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
(FY costs in Real Year Dollars, Totals in both Real Year and FY92 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	FY6	...	FYn	Total (Real Yr.)	Total (FY 92)
Phase A	\$								\$	\$
Phase B	\$	\$							\$	\$
Phase C/D	\$	\$	\$	\$	\$	\$		\$	\$	\$
Phase E	\$	\$	\$	\$	\$	\$		\$	\$	\$
ELV and services	\$	\$	\$	\$	\$	\$		\$	\$	\$
DSN and Other Tracking Support	\$	\$	\$	\$	\$	\$		\$	\$	\$
Other (specify)	\$	\$	\$	\$	\$	\$		\$	\$	\$
Other										
Reserves	\$	\$	\$	\$	\$	\$		\$	\$	\$
Total Cost to NASA	\$	\$	\$	\$	\$	\$		\$	\$	\$
Additional Contributions by Organization (Foreign or Domestic) to:										
Total Phase A	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
- Organization B										
Total Phase B	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
- Organization B										
Total Phase C/D	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
- Organization B										
Total Phase E	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
- Organization B										
ELV Costs	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
Tracking Support	\$	\$	\$	\$	\$	\$		\$	\$	\$
- Organization A										
- Organization B										
Other	\$	\$	\$	\$	\$	\$		\$	\$	\$
Contributed Costs (Total)	\$	\$	\$	\$	\$	\$		\$	\$	\$
							Mission Totals		\$	\$

FIGURE D3
TOTAL MISSION EXPENDITURES BY ORGANIZATIONAL TYPE

<i>Organizational Type</i>	<i>Total Funds (Real Year \$K)</i>	<i>Sub-totals</i>
Educational Institutions	\$	
- University A		\$
- University B		\$
- College C		\$
Industry	\$	
- Industry A		\$
- Corp. B.		\$
- Corp. C		\$
Non-Profit Organizations	\$	
-		\$
-		\$
NASA Centers	\$	
-		\$
-		\$
FFRDCs	\$	
-		\$
-		\$
Total NASA Expenditures	\$	

(d) manage and conduct design;

(e) manage, review, and control hardware/software, documentation, etc. changes;

- (f) manage and conduct systems engineering and integration;
 - (g) manage and conduct procurement including make or buy decisions, subcontract management, etc.;
 - (h) manage and conduct the testing and verification programs, including final checkout and calibration;
 - (i) manage and conduct launch and mission operations;
 - (j) manage and conduct data reduction, analysis, and archiving;
 - (k) coordinate with team members and document agreements;
 - (l) manage and control finances within cost limitations; and
 - (m) report progress to NASA.
- (3) The specific decision-making process regarding all aspects of the mission, including mission descoping, should be described and the individual with ultimate decision-making authority in such cases identified.
- (4) Availability of proposed personnel on the team to successfully administer the investigation contract and technically monitor the implementation.

The schedule and work flow should be clearly laid out, and the method for internal review, control, and direction discussed, including whether or not a form of performance measurement system will be used.

B. Roles, Responsibilities, and Experience of Team Members. The roles, responsibilities, time commitment, and experience of all key personnel must be described in this section, with particular emphasis placed on the responsibilities assigned to the PI and the Project Manager. In addition, information should be provided which indicates what percentage of time will be devoted to the mission, the duration of service, and how changes in personnel will be accomplished (Note: The experience of the PI and science team members does not need to be included in this section since it would have been addressed in Volume II.)

1. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator should be discussed here.
2. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager should be discussed in this section.
3. Other Key Personnel. The roles, responsibilities, time commitments, and experience of the Co-Investigators and other key personnel in the investigation should be described in this section.

The management structure of the investigation team must be described in the proposal. The proposal must identify the teaming approach to be used (see Section 3.7 and the Management Plan) and describe the responsibilities of each team member and their contributions to the investigation. The work of these individuals and institutions must be accounted for in the cost elements breakdowns provided in the COST PLAN (Volume III, Paragraph II).

Financial responsibilities of all team partners must be described. The mechanisms (contracts, subcontracts, cooperative agreements, memoranda of agreement, letters of endorsement, etc.) by which organizations commit to participate as partners on a proposing team must be clearly identified. Include a description of the fee strategy, where appropriate, and the rationale. The proposal signature page must include the signature of an official from each organization represented on the team or contributing to the investigation who is authorized to commit that organization to the proposed investigation. Failure to include any such authorization may be grounds for rejection of the proposal. Non domestic organizations participating as team partners must also meet this requirement.

Any experience (successes and failures) of team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed.

- C. Risk Management and Descope Options. This section should describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Particular emphasis should be placed on describing how the various elements of risk will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. In the event risks cannot be managed successfully and mission objectives must be revised toward the "Performance Floor," then this section should describe the descope options available to the team, their phasing, and their effect on mission performance relative to the previously defined "Performance Floor." This section should identify the latest possible dates at which descope options may be implemented and the procedure by which they would be accomplished.
- D. Facilities and Equipment. All major facilities, laboratory equipment, and ground-support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) essential to the mission in terms of its system and subsystems are to be indicated, distinguishing insofar as possible between those already in existence and those that will be developed in order to execute the investigation. The outline of new facilities and equipment should also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

APPENDIX E **NASA NEW START INFLATION INDEX**

Cost data is requested in both FY1992 dollars and in real-year dollars. The inflation rates to be used in the calculation of real-year dollars, and the resultant inflation totals, is shown by year in the following table:

Fiscal Year	1992	1993	1994	1995	1996	1997	1998
Inflation Rate	-	4.6%	4.2%	4.6%	4.5%	4.3%	4.4%
Cumulative Inflation Index	1	1.046	1.090	1.140	1.191	1.243	1.297

Fiscal Year	1999	2000	2001	2002	2003	2004	2005
Inflation Rate	4.4%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Cumulative Inflation Index	1.354	1.415	1.479	1.546	1.615	1.688	1.764

Note: Use an inflation rate of 4.5% for years beyond 2005.

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APPENDIX F

DISCOVERY LAUNCH SERVICES INFORMATION SUMMARY

The launch vehicles used to launch Discovery spacecraft will be procured by NASA under one of the following programs: Small Expendable Launch Services (SELVS), Medium Expendable Launch Services (MELVS), or Medium-Lite Expendable Launch Services (Med-Lite).

The current SELVS Contract provides launch services on the Orbital Sciences Corporation (OSC) Pegasus launch vehicle. The Pegasus configuration (3 stage) under the SELVS Contract does not include provision for a solid rocket motor (SRM) fourth stage (such as the STAR 27), which may be necessary to achieve the required launch energies for Discovery spacecraft. The current MELVS Contract provides launch services on the McDonnell Douglas Delta II launch vehicle. The Delta II configurations available for Discovery spacecraft include the Delta 7925 (with nine strap-on SRM's), and the Delta 7325 (with three strap-on SRM's). The Delta 7920 could be considered if there is a spacecraft concern with regards to the third stage spin-stabilization on the 7925/7325. NASA plans to procure Med-Lite class launch services for launches beginning in 1998. Design constraints for Med-Lite class missions include the minimum requirements of anticipated Discovery spacecraft.

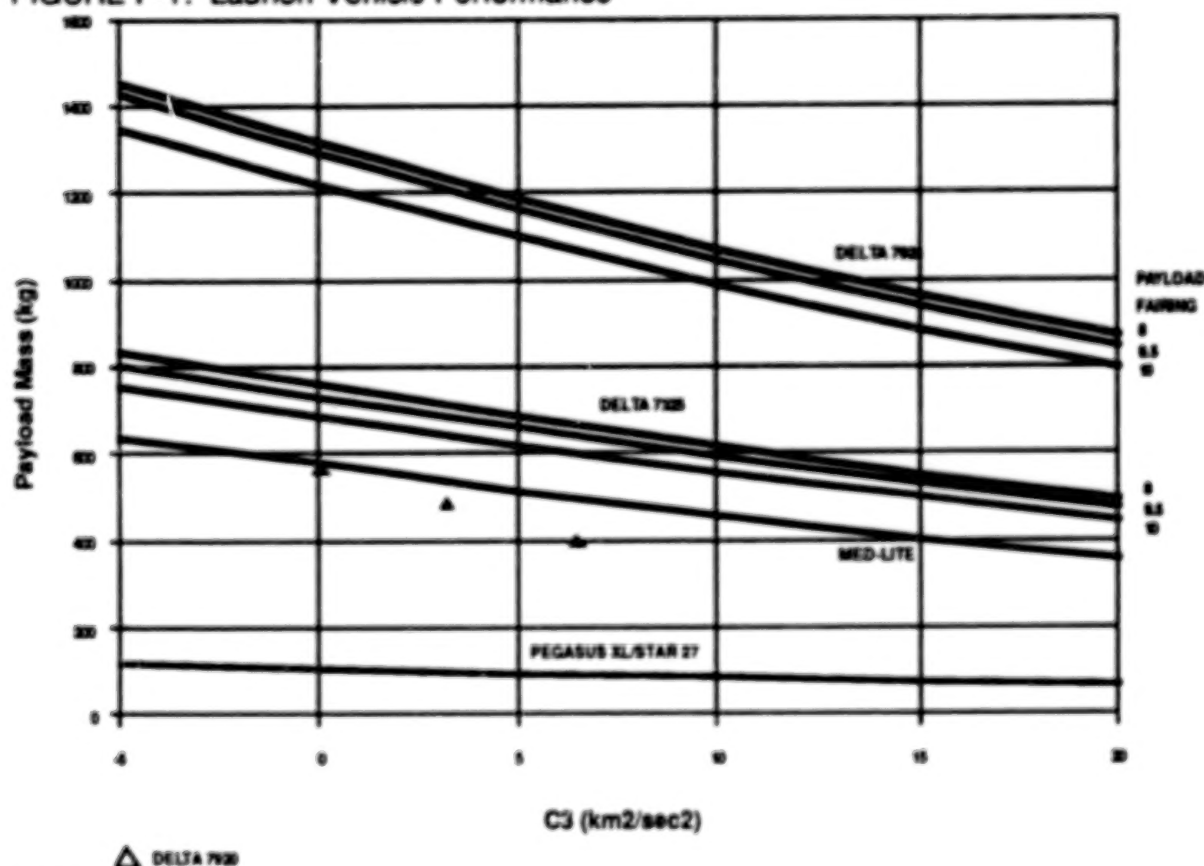
Figure F-1 illustrates the launch vehicle performance available for the various launch services mentioned above as a function of launch energy (C3). Some of the Delta II configurations (7925 and 7325) also show performance variation as a function of the size of the payload fairing used (8, 9.5, and 10 foot diameters). Delta 7920 performance is shown assuming the use of the 10 foot diameter payload fairing. The Pegasus performance curve assumes the use of a STAR 27 SRM as a fourth stage, although other SRM's could be used as well. The spacecraft provider would be responsible for procurement of the fourth stage on the Pegasus and any associated guidance necessary. There are a number of different launch vehicles which could fulfill the Med-Lite performance requirements.

NASA's launch services contracts include the provision of spacecraft/launch vehicle integration, analysis, and post-flight mission data evaluation. NASA also provides technical oversight of the launch vehicles and coordinates mission-specific integration activities. Figures F-2 and F-3 show integration activities for a typical Pegasus and Delta mission, respectively.

Table F-4 gives the cost associated with each launch service, and the appropriate cost spread by fiscal year. The cost numbers assume a Fiscal Year 1999 launch (in July), and are given in real year dollars. The cost for launches in years later than 1999 may be calculated by applying the proper inflation indices to the cost spreads given. The cost numbers include all launch services, mission unique launch vehicle modifications and integration, payload processing, and oversight. Costs for launch delay penalties are not included. The difference in cost between a Delta 7925 and Delta 7920 is small compared to the total cost, and is not shown. The SELVS cost does not include a fourth stage, which must be provided by the proposer when calculating total mission costs.

More detailed information on the Medium, Medium-Lite, and Small launch services is provided in the Discovery Program Library (DPL), available from the Discovery Program Office (see Section 4.1.1 and Appendix H). Additional information (including, but not limited to: performance, mission integration, and cost) may be obtained through the NASA Headquarters Launch Vehicles Program Office.

FIGURE F-1: Launch Vehicle Performance



Notes:

1. Pegasus launches are assumed to occur from Wallops Flight Facility, and all others are assumed to occur from Cape Canaveral Air Force Station.
2. Delta payloads less than 680 kg may require hardware modifications which may decrease spacecraft mass.

FIGURE F-2: Typical Pegasus Mission Integration Activities

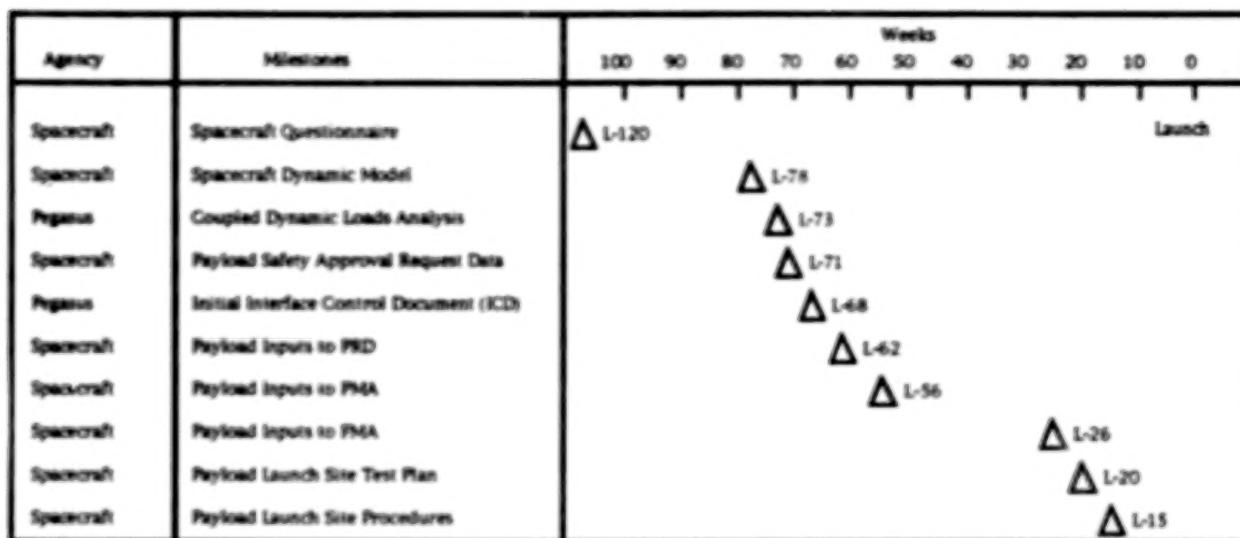


FIGURE F-3: Typical Delta Mission Integration Activities

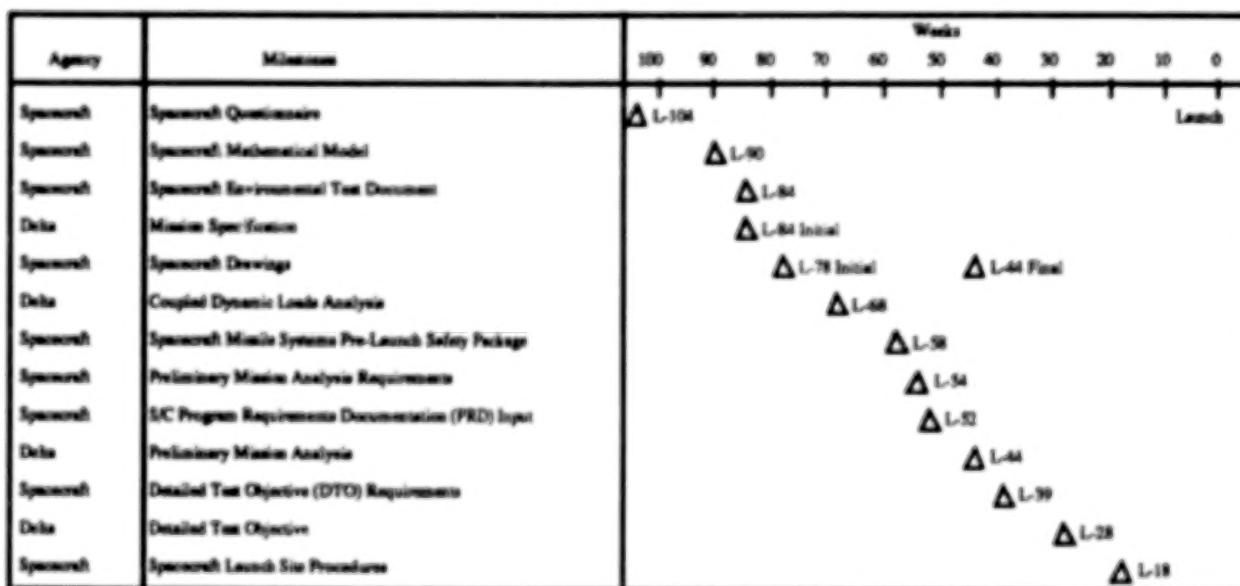


TABLE F-4: Launch Service Costs

LAUNCH SERVICE	FY96	FY97	FY98	FY99	COST (\$M)*
SELVS Pegasus XL	0	5	4	7	16
MED-LITE TBD	1	9	13	11	34
MELVS Delta 7325	1	13	22	18	54
MELVS Delta 7925	1	14	25	20	60

* Assumes a Fiscal Year 1999 launch, in real year dollars.

APPENDIX G
REGULATIONS GOVERNING PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

- 52.225-3 Buy American Act -- Supplies (January 1994)
- 52.225-7 Balance of Payments Program (April 1984)
- 52.225-9 Buy American Act -- Trade Agreements -- Balance of Payments Program (January 1994)
- 52.225-10 Duty-Free Entry (April 1984)
- 52.225-11 Restrictions on Certain Foreign Purchases (May 1992)
- 52.225-17 Buy American Act -- Supplies Under European Community Agreement (January 1994)
- 52.225-18 European Community Sanction for End Products (May 1993)
- 52.225-19 European Community Sanction for Services (May 1993)
- 52.225-21 Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1994)

The following NASA FAR Supplement clause covers the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

- 18-52.225-75 NASA Domestic Preference (April 1991)

The proposer is directed to the Federal Acquisition Regulation and the NASA FAR Supplement for further information on these regulations.

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APPENDIX H

CONTENTS OF THE DISCOVERY PROGRAM LIBRARY (DPL)

(1) DSN Support of Earth Orbiting and Deep Space Missions

This document describes the basic support activities that the DSN can provide for Discovery Program Missions. Included are descriptions of standard mission interfaces and categories as defined by the JPL Office of Telecommunications and Data Acquisition (TDA), along with descriptions of present and planned capabilities. This document also discusses mission design support functions the TDA performs, along with recommended communications standards for use in Deep Space missions.

(2) Space Network Users Guide

The purpose of this document is to provide prospective users of the Tracking and Data Relay Satellite System (TDRSS) with the information necessary for mission planning and execution.

(3) Vehicle Interface for Discovery Spacecraft

This document contains additional information on the launch vehicle interfaces for the launch services which will be provided by NASA.

(4) NASA Technology Transfer Resources

This document describes the resources available to help NASA investigators transfer their technology developments to other parts of NASA and to the private sector.

(5) OSS Integrated Technology Strategy

This document describes the overall strategy being pursued by NASA's Office of Space Science (OSS) in order to integrate the technologies under development in OSS into other parts of NASA.

(6) Management of Major System Programs and Projects (NHB 7120.5)

This document provides a reference for typical activities, milestones, and products in the development and execution of NASA missions.

(7) Planetary Data System Data Preparation Workbook

This document describes the basic formats and requirements used for the archiving of planetary data products by the Planetary Data System (PDS).

(8) Planetary Protection Requirements

Includes information on Planetary Protection Requirements for NASA spacecraft missions. Individual volumes include: NMI 8020.7D (Biological Contamination Control For Outbound And Inbound Planetary Spacecraft), NHB 8020.12B (Planetary Protection Provisions for Robotic Extraterrestrial Missions), and NHB 5340.1B (NASA Standard Procedures for the Microbiological Examination of Space Hardware).

(9) Flight System Testbed Capabilities Document

Describes the JPL Flight System Testbed facility.

(10) Multimission Operations Systems Office (MOSO) Information

Describes mission operations support capabilities available at the Jet Propulsion Laboratory.

(11) Into the Twenty-First Century - Mission Operations

Describes mission operations support capabilities available at the Goddard Space Flight Center.

(12) NASA Directives Master List and Index (NHB 1410.13M)

Master list of NASA Management Directives, many of which may have application to individual Discovery Missions.

(13) Discovery Management Workshop Reports

Includes "Final Report of the Discovery Management Workshop" and "Recommendations for Discovery Policy and Implementation Guidelines", two documents generated by the April 1993 Discovery Management Workshop which was convened to address issues in the management of individual Discovery missions and of the Discovery Program as a whole.

(14) Discovery Management Plan

Describes the means by which the Discovery Program Office plans to implement the Discovery Program.

(15) Discovery Mission Fact Sheets

These fact sheets provide summary information on the Near-Earth Asteroid Rendezvous and Mars Pathfinder missions.

APPENDIX I

CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

This certification is required by the regulations implementing the Drug-Free Workplace Act of 1988, 34 CFR Part 85, Subpart F. The regulations, published in the January 31, 1989 Federal Register, require certification by grantees, prior to award, that they will maintain a drug-free workplace. The certification set out below is a material representation of fact upon which reliance will be placed when the agency determines to award the grant. False certification or violation of the certification shall be grounds for suspension of payments, suspension or termination of grants, or government-wide suspension or debarment (see 34 CFR Part 85, Sections 85.615 and 85.620).

I. GRANTEES OTHER THAN INDIVIDUALS

A. The grantee certifies that it will provide a drug-free workplace by:

- (a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b) Establishing a drug-free awareness program to inform employees about --
 - (1) The dangers of drug abuse in the workplace;
 - (2) The grantee's policy of maintaining a drug-free workplace;
 - (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will
 - (1) Abide by the terms of the statement; and
 - (2) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction;
- (e) Notifying the agency within ten days after receiving notice under subparagraph (d) (2) from an employee or otherwise receiving actual notice of such conviction;
- (f) Taking one of the following actions, within 30 days of receiving notice under subparagraph (d) (2), with respect to any employee who is so convicted --
 - (1) Taking appropriate personnel action against such an employee, up to and including termination; or
 - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or Local health, Law enforcement, or other appropriate agency;
- (g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e), and (f)

B. The grantee shall insert in the space provided below the site(s) for the performance or work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

Check ☐ if there are workplaces on file that are not identified here.

II. GRANTEES WHO ARE INDIVIDUALS

The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance in conducting any activity with the grant.

Organization Name	AO or NRA Number and Title
Printed Name and Title of Authorized Representative	
Signature	Date
Printed Principal Investigator Name	Proposal Title

APPENDIX J

**CERTIFICATION REGARDING
DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS
PRIMARY COVERED TRANSACTIONS**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participants' responsibilities. The regulations were published as Part VII of the May 28, 1988 Federal Register (pages 19160-19211). Copies of the regulations may be obtained by contacting the U.S. Department of Education, Grants and Contracts Service, 400 Maryland Avenue, S.W. (Room 3633 GSA Regional Office Building No. 3), Washington, D.C. 20202-4725, telephone (202) 732-2505.

A. The applicant certifies that it and its principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three-year period preceding this application been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification;
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lowered Tier Covered Transactions (Subgrants or Subcontracts)

- (a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principles is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department of agency.
- (b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name	AO or NRA Number and Title
-------------------	----------------------------

Printed Name and Title of Authorized Representative	
---	--

Signature	Date
-----------	------

Printed Principal Investigator Name	Proposal Title
-------------------------------------	----------------

APPENDIX K

CERTIFICATION REGARDING LOBBYING

As required by S 1352 Title 31 of the U.S. Code for persons entering into a grant or cooperative agreement over \$100,000, the applicant certifies that:

- (a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;
- (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Organization Name

AO or NRA Number and Title

Printed Name and Title of Authorized Representative

Signature

Date

Printed Principal Investigator Name

Proposal Title

NASA Research Announcement (NRA)/Announcement of Opportunity (AO) Mailing List Update

If your current address is NOT up-to-date, please fill out this form completely.

This is the update form for the NASA Office of Space Sciences (OSS) NRA/AO mailing list. Please fill out CONTACT INFORMATION completely. Check only those that apply in Institution Type and Discipline. Fold the form, secure with tape, and mail it back to the address on the reverse side. Proper postage must be applied.

Please check which announcements you would like to receive:

- ☐ 1. NASA Research Announcements (basic, non-flight, on-going research)
☐ 2. Announcements of Opportunity (specific space flight mission)

Must check one, please include code number from mailing label:

- ☐ 1. Please **add** my name to the mailing list.
☐ 2. Please **remove** my name from the mailing list (please attach mailing label)
☐ 3. Please **update** my current listing

CONTACT INFORMATION

If your address has changed or your mailing label is incorrect, please provide **COMPLETE** contact information

Code Number: (obtain from mailing label)	<input type="text"/>	Salutation: (Mr., Mrs., Ms., Dr., Prof., etc.)	<input type="text"/>	Suffix: (Ret., Ph.D., Jr., III, etc.)	<input type="text"/>
First Name:	<input type="text"/>	MI:	<input type="text"/>	Last Name:	<input type="text"/>
Organization:	<input type="text"/>				
Division / Department:	<input type="text"/>				
Street:	<input type="text"/>				
City:	<input type="text"/>	State:	<input type="text"/>	Zip:	<input type="text"/>
Telephone No:	<input type="text"/>	Fax No:	<input type="text"/>		
E-Mail Address:	<input type="text"/>		Internet Address:	<input type="text"/>	
Country: (foreign addresses, please specify)	<input type="text"/>				

Institution Type

(check only those that apply)

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|--|---|---|
| <input type="checkbox"/> 1. College or University | <input type="checkbox"/> 4. Minority Business | <input type="checkbox"/> 7. Other Government Agency |
| <input type="checkbox"/> 2. Minority College or University | <input type="checkbox"/> 5. NASA HQs/Center | <input type="checkbox"/> 8. Private Industry |
| <input type="checkbox"/> 3. Foreign Addressee | <input type="checkbox"/> 6. Nonprofit Corporation | <input type="checkbox"/> 9. Small Business |

Societies:

- ☐ A. American Astronomical Society ☐ B. American Geophysical Union ☐ C. Others _____

Discipline:

(check only those that apply)

1. Astronomy and Astrophysics

- ☐ A. Theory and Modeling
☐ B. Instrumentation (Technology Dev)
☐ C. Laboratory Astrophysics
☐ D. Data Analysis (Archival)
☐ E. Observational Programs

2. Solar System Exploration

- ☐ A. Planetary Atmospheres and Astronomy
☐ B. Planetary Materials and Geochemistry
☐ C. Planetary Geology and Geophysics
☐ D. Instrument Development
☐ E. Origins of Solar Systems
☐ F. Exobiology

3. Space Physics

- ☐ A. Cosmic and Heliosphere Physics
☐ B. Solar Physics
☐ C. Magnetospheric Physics
☐ D. Ionosphere-Mesospheric Physics

4. Information Systems/Computer Science

- ☐ A. High Performance Computing and Networking
☐ B. Scientific Data Analysis and Visualization
☐ C. Science Data Storage and Management
☐ D. Software Technology

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